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MONTHLY PROGRESS REPORT

QUALITY ASSURANCE PLAN

AMERICAN CHEMICAL SERVICE, INC.

GRIFFITH, INDIANA

JUNE 1985

* * * Company Confidential * * *

REMI

PERFORMANCE OF REMEDIAL RESPONSE ACTIVITIES AT UNCONTROLLED HAZARDOUS WASTE SITES

U.S. EPA CONTRACT NO. 68-01-6939

**CAMP DRESSER & MCKEE INC.
PRIME CONTRACTOR**

QUALITY ASSURANCE PLAN
AMERICAN CHEMICAL SERVICE, INC.

GRIFFITH, INDIANA

JUNE 1985

* * * Company Confidential * * *

Prepared for:

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Document No. 160-WP1-OP-AZLV-2
W.A. No. 61-5LJ7.0

PERFORMANCE OF REMEDIAL RESPONSE
ACTIVITIES AT UNCONTROLLED HAZARDOUS
WASTE SITES (REM II)

U.S. EPA CONTRACT NO.: 68-01-6939

QUALITY ASSURANCE PROJECT PLAN (QAPP)
FOR
AMERICAN CHEMICAL SERVICE, INC.

GRIFFITH, INDIANA

DOCUMENT NO.: 160-WP1-OP-AZLV-2

WORK ASSIGNMENT NO.: 61-5LJ7.0

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American Chemical Service, Inc.,
Griffith, Indiana

Work Assignment No.: 61-5LJ7.0
EPA Contract No.: 68-01-6939
Document Control No.: 160-WP1-EP-BFTA-1

Gentlemen:

Camp Dresser & McKee, Inc. is pleased to submit this Draft Quality Assurance Project Plan for American Chemical Service, Inc. located in Griffith, Indiana.

This plan discusses the quality assurance protocol applicable to the ACS site. Please note that the Sampling and Analysis Plan is in Appendix B of this QAPP.

If you have any questions or comments please contact me.

Very truly yours,

CAMP DRESSER & MCKEE, INC.

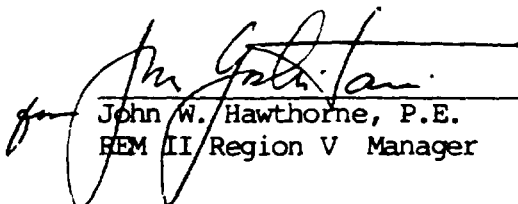

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AMERICAN CHEMICAL SERVICE , INC. SITE
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APPENDIX

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American Chemical Service, Inc.
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May 25, 1985
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QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
AMERICAN CHEMICAL SERVICE, INC.
GRIFFITH, INDIANA

SECTION 1

INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) requires participation of all U.S. EPA contractors in a centrally managed quality assurance (QA) program. This requirement applies to all environmental monitoring and measurement efforts mandated or supported by U.S. EPA.

Each contractor generating data has the responsibility to implement minimum procedures to assure that the precision, accuracy, completeness and representativeness of its data are known and documented. To insure the responsibility is met uniformly, each U.S. EPA contractor must prepare a written QA Project Plan (QAPP) covering each project it is contracted to perform.

This QAPP presents the organization, objectives, functional activities and specific QA and quality control (QC) activities associated with the Remedial Investigation/Feasibility Study (RI/FS) at American Chemical Service, Inc. in Griffith, Indiana. The QAPP is designed to achieve the specific data quality goals of the RI/FS at the American Chemical Service, Inc. (ACS) site.

SECTION 2

PROJECT DESCRIPTION

The remedial investigation portion of the RI/FS is designed to gather specific information necessary to determine if the site presents a hazard to human health or welfare or to the environment and to evaluate potentially feasible remedial actions. All tasks and subtasks are directed toward accomplishment of these primary objectives.

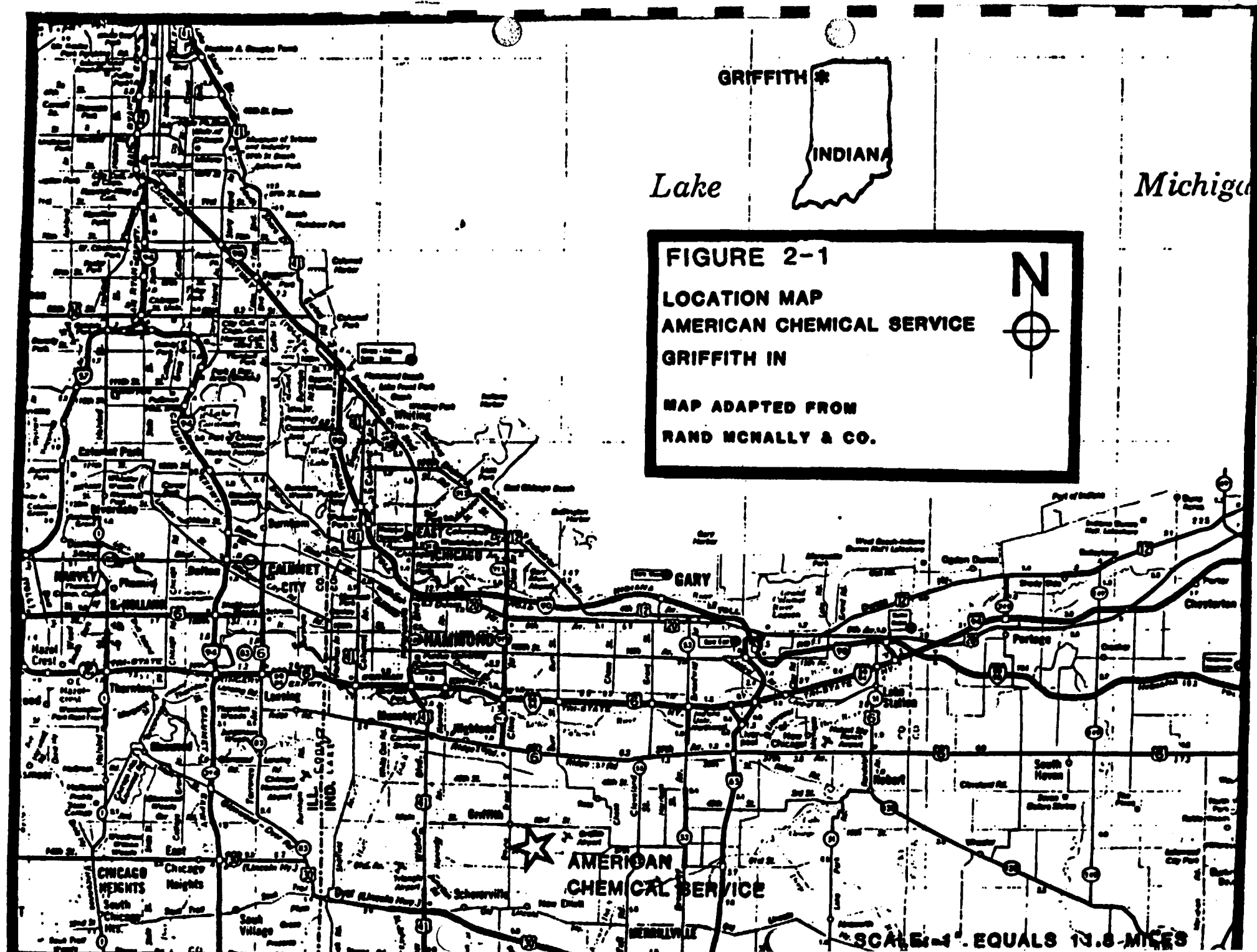
2.1 BACKGROUND

For the purpose of this plan the site is defined as American Chemical Service, Inc., Pazmey Corporation (formerly Kapica Drum, Inc. and Griffith City Landfill (see Figures 2-1 and 2-2)).

The American Chemical Service, Inc. facility is located $\frac{1}{2}$ mile southeast of Griffith in the northeast $\frac{1}{4}$ of the southeast $\frac{1}{4}$, Section 2, Township 35 north, Range 9 west, Lake County, Indiana. It is bordered by the Griffith Landfill on the southwest and Pazmey Corporation (formerly Kapica Drum, Inc.) on the south. The Chesapeake and Ohio Railroad bisects the site. Elevations range from 635 feet to 650 feet, and bedrock elevations from 500 feet to 525 feet.

Griffith is located in the Calumet Lacustrine Plain, an area of high population and industrial use in extreme western Indiana. There are 40-250 feet of Wisconsinan Age Surficial deposits that comprised the bed of Glacial Lake Chicago. Calumet Lacustrine Plain is an area of low relief with three relict shorelines containing dunes (some up to 40 ft. high). Bedrock is 4000 feet of Cambrian to Devonian Age limestones, dolomite, sandstones, and shales overlying Pre-Cambrian Granitic basement rock. The Detroit River and Traverse Formations, comprised of limestone (some Karst) underly the town of Griffith.

The sedimentary rocks are gently flexed to form a saddle-like structure of part of the Kankakee Arch. Dip is 5-7 feet/mile to southeast. Drainage of surface waters in Griffith is to the north and the Little Calumet River is the major drainageway. The sediments of the Calumet Lacustrine Plain are fine lake silts and clays, paludal deposits of muck and peat, great expanses of beach and dune sand as out-wash and in till inclusions, and clay-rich tills. The three beach ridges in the area were formed as falling lake levels in Glacial Lake Chicago stabilized slightly after the Valparaiso Moraine was breached. Each beach ridge formation was accompanied by near-shore foredunes.



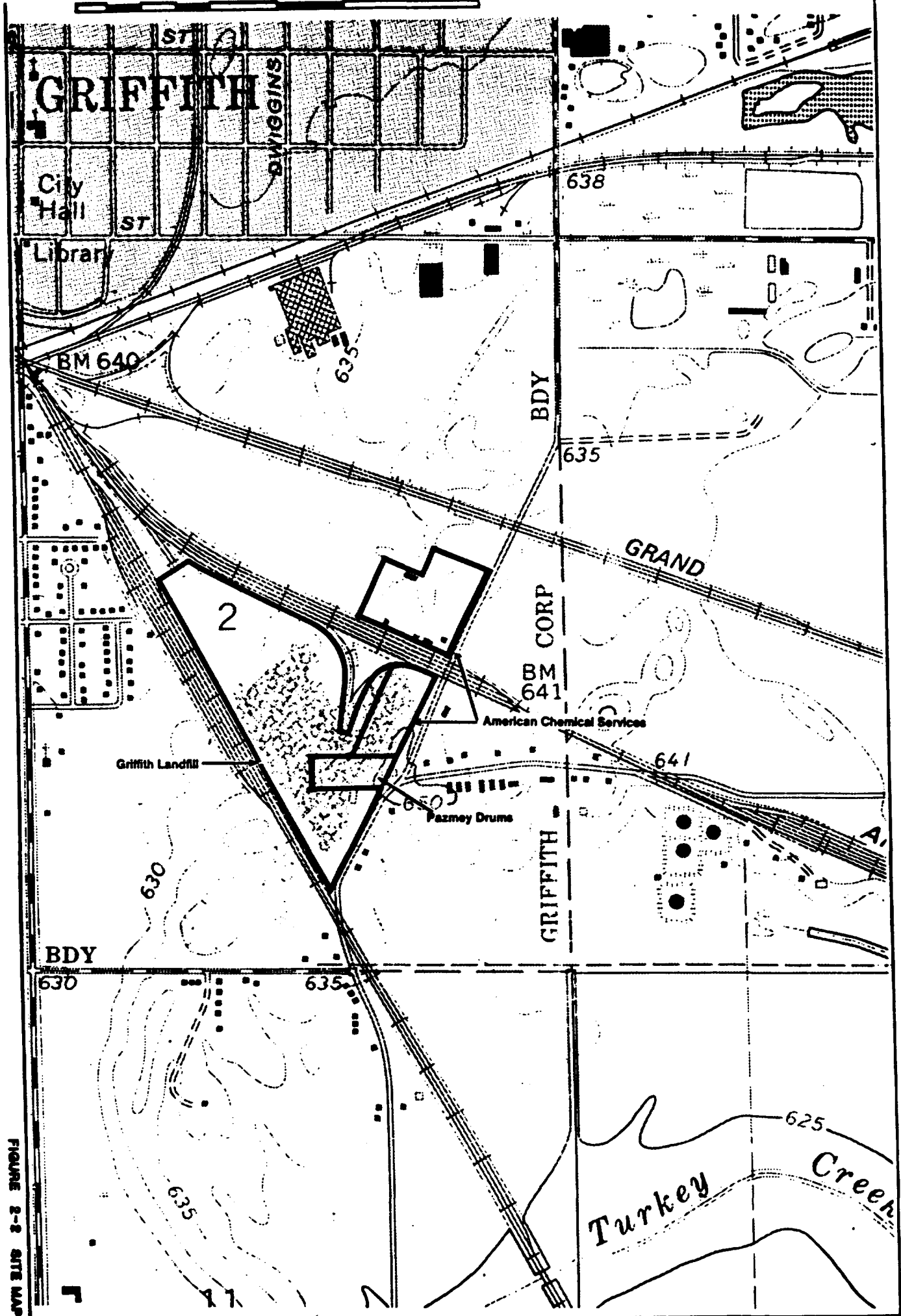


FIGURE 2-2 SITE MAP

In 1972, ACS discontinued the use of its Off-site Containment Area and this area was capped with a reported two to three foot layer of soil. In 1980, a 31-acre portion of property owned by ACS located to the west of the Off-site Containment Area was sold to the City of Griffith. The city used this property for an expansion of their municipal landfill, which had been operating since the 1950's to the southwest of the ACS property. This transaction reportedly included a strip of the west edge of the Off-site Containment Area. As previously mentioned, ACS began operation of an incinerator at their plant in 1968. Mr. Tarpo has reported a rate of 2 million gallons of ACS and off-site waste per year were burned in this incinerator prior to its closure of 1970.

In October, 1971, ACS began a swine fat reprocessing operation. Due to its economic liability to the firm, it was terminated in April, 1973. In May, 1972, a production line was opened for the manufacturing of a gasoline additive for the American Oil Company, referred to as "Amotone." In early 1974, ACS began manufacturing a plasticizer called "Epoxol" for the Swift Chemical Division. Both materials are currently being manufactured at the facility. Since 1983, "Epoxol" has been produced by ACS for its own distribution. The major operation at the site, however, remains solvent recovery. Aqueous wastes generated at the facility are reported to be disposed of off site.

The Griffith Landfill has been in operation since the 1950's. It has been included in the site because it has been reported (Reply to U.S. EPA Request For Information sent to ACS-10/18/84) that hazardous wastes from American Chemical Services, Inc. and Kapica Drum, Inc. were disposed of in the landfill prior to the implementation of RCRA. (November, 1980).

Kapica Drum, Inc. (now Pazmey Corporation under new ownership) began operation in 1951. The business of Kapica Drum, Inc. was drum reconditioning which resulted in the generation of rinse water from drums that contained hazardous wastes. It has been included in the site because it has been reported (Reply to U.S. EPA Request For Information sent to ACS-10/18/84) that hazardous waste drum rinse water has been discharged on the Kapica Drum, Inc. property.

Existing data indicate that environmental monitoring and sampling has occurred on four occasions during the period May 1980 to November 1984. Sampling efforts included soil, leachate, runoff and groundwater samples. Samples were also analyzed from residential water supply wells. The existing analytical data from the sampling activities is presented in Appendix A. Table 2-1 shows the types of waste mentioned in the file that are suspected to have been disposed of at ACS.

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American Chemical Service, Inc.
Section: 2
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May 25, 1985
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TABLE 2-1

TYPES OF WASTES DISPOSED OF AT THE AMERICAN CHEMICAL SERVICE, INC.

Lead pigments
Chromium
Cyanide
Acetone
2,4-D
2,4,5-TP
Paint Residues
Resins
Pigments
Plasticizers
Formic Acid
Sodium Hydroxide
Maleic Anhydride
Furfuryl Alcohol
Lacquer
Acetic Acid
Animal Oils
Methanol
Hexane
1,1,-Trichloroethane
Trichloroethylene
Methylene Chloride
Toluene
Benzene
Other low boiling solvents

2.2 PROJECT OBJECTIVES

The purpose of this Remedial Investigation/Feasibility Study (RI/FS) is to characterize the hazard or threat of hazard posed by the American Chemical Service, Inc. (ACS) site and, to identify a cost-effective, environmentally sound remedial action as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Contingency Plan, 40 CFR Part 300 Subpart F (NCP). Before alternatives for remedial action can be considered in the FS, there must be sufficient information available to verify the need for remedial action, and to develop, screen and evaluate potential alternatives. The RI will be performed to gather and assess the data needed to accomplish the following:

- o Determine if hazardous waste disposal at the American Chemical Service, Inc. (ACS) site poses a threat to health or the environment.
- o Determine the characteristics, extent and magnitude of contamination on the site.
- o Characterize the location, extent and magnitude of contamination in areas located adjacent to the site.
- o Identify and characterize the pathways of contaminant migration from the site.
- o Evaluate the nature and magnitude of contamination, if any, in the nearby residential wells.
- o Define on-site physical features and facilities that could affect contaminant migration, containment, or cleanup.
- o Develop, screen and evaluate potential remedial action alternatives.
- o Recommend the most cost-effective remedial action alternative(s) that adequately protects health, welfare and the environment.
- o Prepare a conceptual design of the recommended alternative.
- o Support future enforcement action under CERCLA.

The technical approach to completion of the RI/FS is described in Section 4 and 5 of the Work Plan and contains 14 major elements, seven in the RI and seven in the FS:

- o Study Area Survey
- o Source Characterization
- o Site Characterization
- o Feasibility Study Testing
- o Contaminant Pathway and Transport Evaluation
- o Public Health Evaluation/Endangerment Assessment
- o Remedial Investigation Report
- o Preliminary Remedial Alternative Development
- o Remedial Alternative Screening
- o Remedial Alternative Analysis
- o Comparative Evaluation of Acceptable Alternatives
- o Feasibility Study Report
- o EPA Decision Document Preparation Assistance
- o Pre-Design (Conceptual Design) Report

The environmental monitoring and measurement efforts covered by this QAPP are contained in the Detailed Site Characterization Studies.

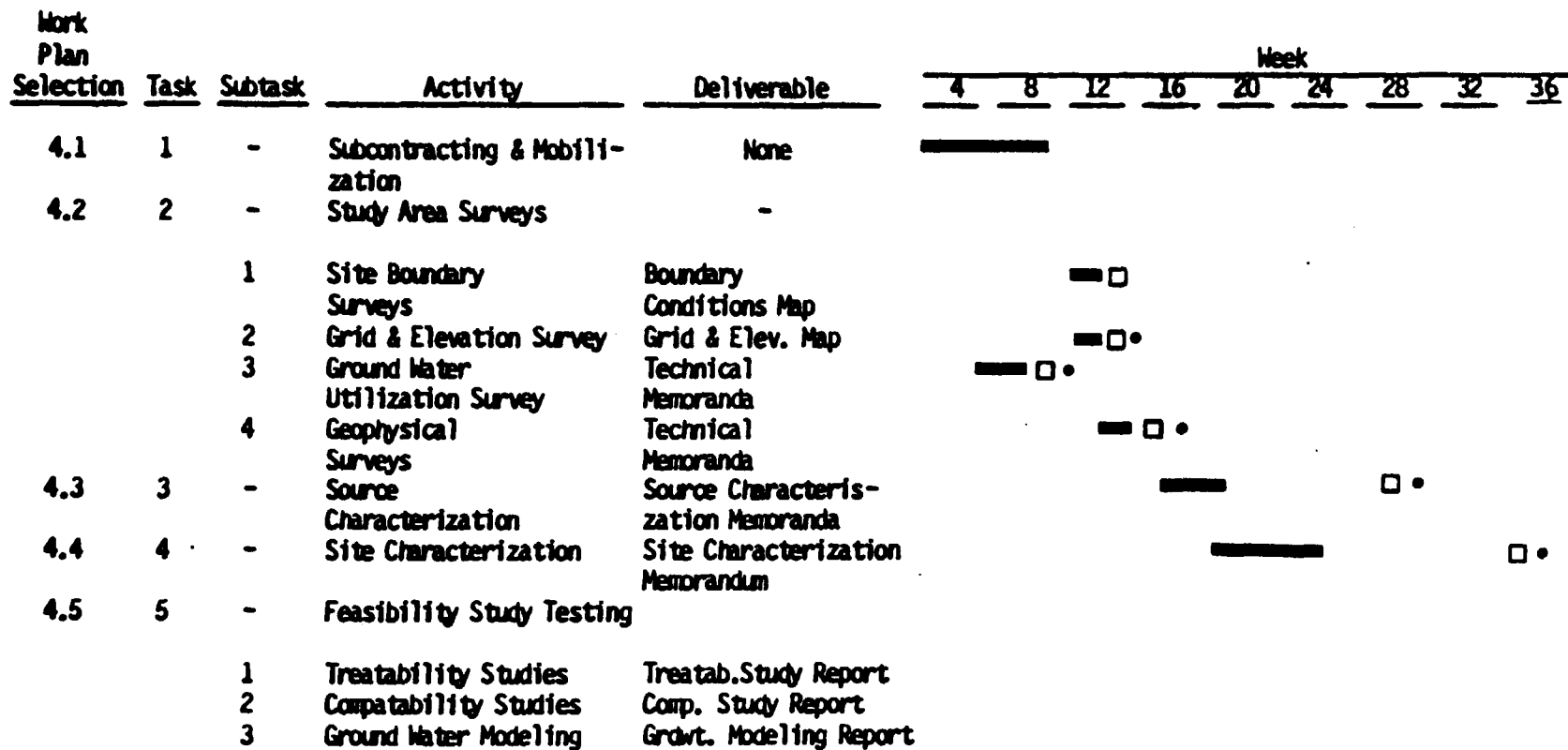
2.3 SCHEDULE

Figures 2-3 and 2-4 show the anticipated schedules for the Remedial Investigation phase and Feasibility Study phase respectively.

The sequence of events proposed in the RI/FS schedule begins with the authorization to proceed issued by the U.S. EPA and is scheduled to take approximately 26 months. The remedial investigation is scheduled to take approximately 14 months from the authorization to proceed to the submission of the final remedial investigation report. Remedial Investigation field work is scheduled to take approximately 3 months. The feasibility study is scheduled to be completed within 12 months of the submission of the final remedial investigation report. Actual work on the feasibility study will overlap with the end of the remedial investigation phase. Work on the feasibility study phase is scheduled to begin after the draft remedial investigation report is submitted. This overlap will help to reduce the overall RI/FS completion.

FIGURE 2-3

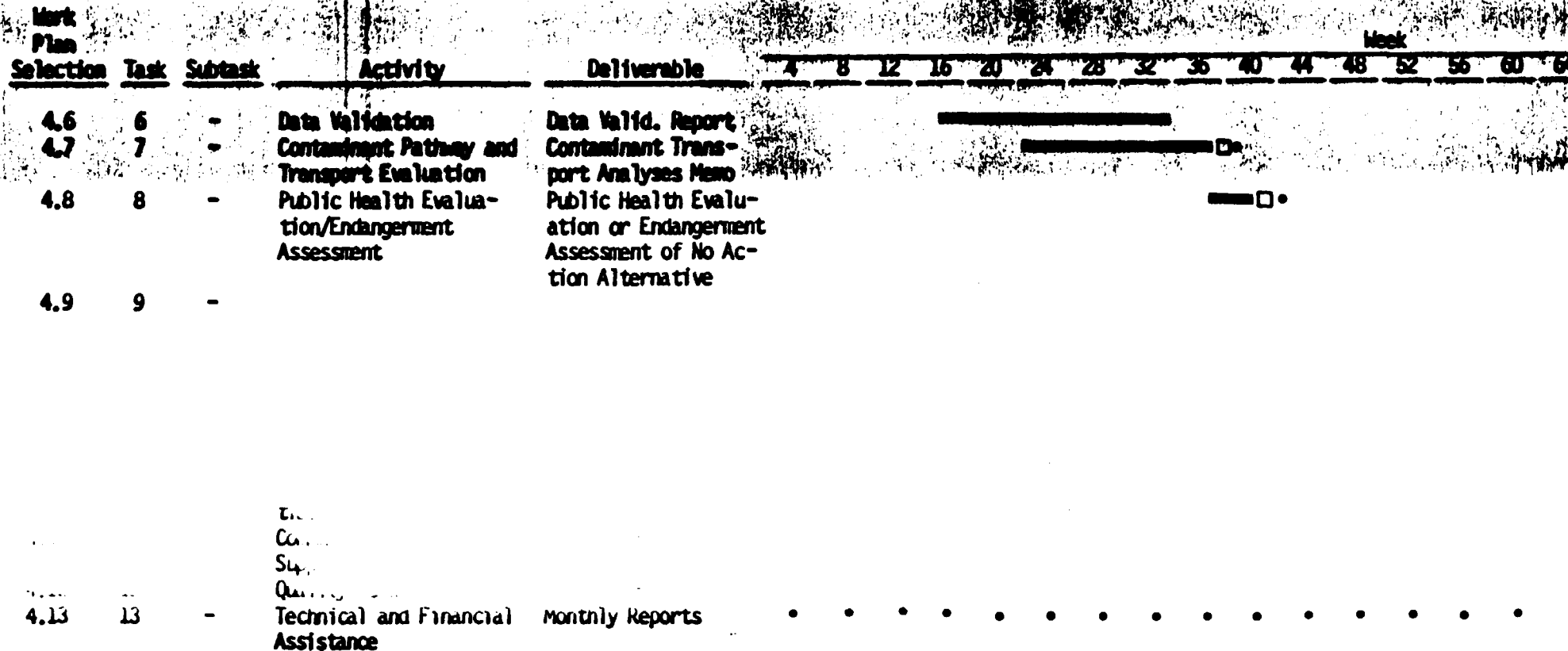
ACS REMEDIAL INVESTIGATION SCHEDULE



█████ - Weston activity.
 □ - REM II review.
 • - EPA review.

FIGURE 2-3 (continued)

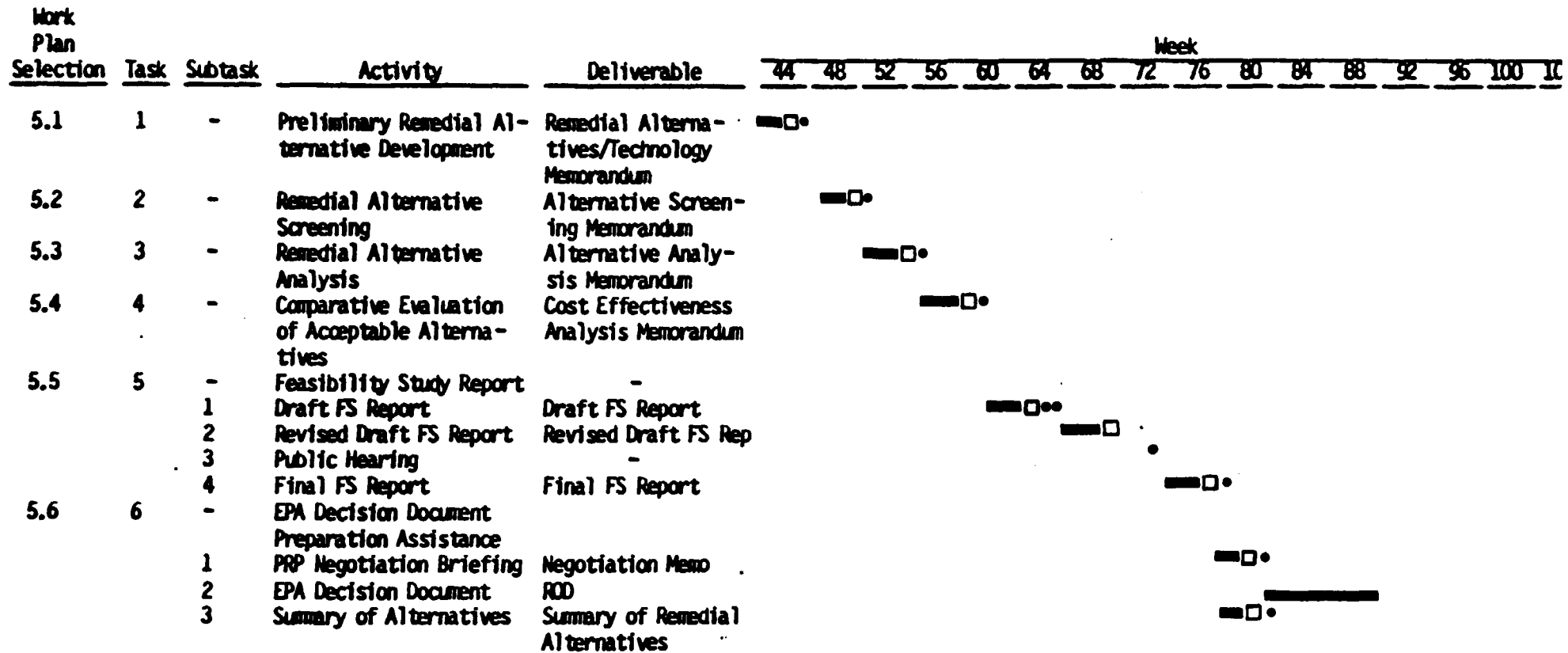
ACS REMEDIAL INVESTIGATION SCHEDULE



- - Weston activity.
- - REM II review.
- - EPA review.

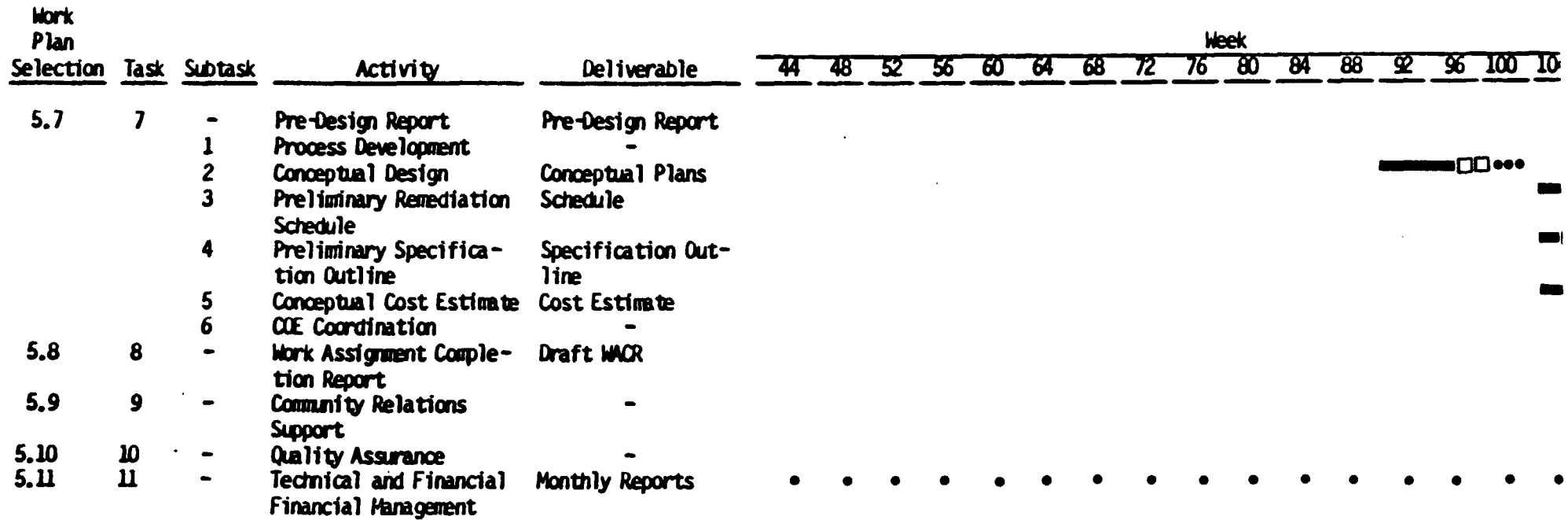
FIGURE 2-4

ACS FEASIBILITY STUDY SCHEDULE



■ - Weston activity.
 □ - REM II review.
 • - EPA review.

FIGURE 2-4 (continued)
ACS FEASIBILITY STUDY SCHEDULE



■ - Weston activity.
 □ - REM II review.
 • - EPA review.

2.4 DATA USAGE

The data obtained during this RI will be used to achieve the objectives outlined above (Subsection 2.2) within the scope and authority of CERCLA. In addition, the data obtained from sampling and analysis of water supply wells will be evaluated with respect to the National Interim Primary Drinking Water Standards, 40 CFR Part 141 Subpart B. RCRA characterization of wastes is not an objective of the current field investigation. An evaluation of the adequacy of the data for the uses described above will be performed as part of the RI Report.

2.5 SAMPLING NETWORK DESIGN

The objectives of the sampling program to be undertaken as part of the RI/FS at the American Chemical Service, Inc. (ACS) site in Griffith, Indiana, are as follows:

- o To determine and characterize the location, nature, and volume of the contaminated areas on-site including the Still Bottoms Pond, Treatment Pond 1, Kapica Dump Site, the On-Site Drum Containment Area, and the Off-Site Drum Containment Area. Also included in the sampling program is monitoring well installation at the suspected waste disposal area in the Griffith Landfill.
- o To determine the details of on-site soil stratigraphy and the stratigraphy of adjacent off-site areas.
- o To determine the hydrogeologic conditions in the upper aquifer and in the water supply aquifer, including vertical and horizontal groundwater flow conditions on-site and in adjacent off-site areas.
- o To determine the configuration of the water table in the upper aquifer and the potentiometric surface in the water supply aquifer on-site and in adjacent areas off-site.
- o To identify surficial drainage features and flow patterns, and characterize the relationship of surface water to groundwater on-site and in adjacent off-site areas.

- o To characterize the extent and migration of groundwater contamination in the upper aquifer and in the water supply aquifer on-site and in adjacent off-site areas.
- o To characterize the extent of surface water and sediment contamination on-site and in adjacent off-site areas.
- o To determine if groundwater currently being pumped by private wells within one mile of the site is contaminated with priority pollutants.

The sampling (monitoring) network designed to achieve these objectives and the rationale for that design are presented in Section 2 of the Sampling and Analysis Plan, which is attached in Appendix B.

2.6 SAMPLE MATRICES/PARAMETERS/FREQUENCY

The scope of the sampling activities planned at the American Chemical Service, Inc. (ACS) site includes the installation of 40 groundwater monitoring wells, the excavation of six test pits, the drilling of 14 soil and waste borings, and the collection and analysis of 325 environmental samples. The media/matrices to be sampled include waste, surface water, sediment, private wells, soil, and groundwater. Chemical analysis to detect priority pollutants and other hazardous materials will be performed on 259 samples, of which 213 will be investigative, 23 will be duplicates, and 23 will be field blanks. Geotechnical index properties will be determined for 66 samples to characterize on-site soil materials. The sampling and analysis program is summarized in Table 2-2, which indicates the specific parameters to be measured, the number and frequency of sampling, and the level of QA effort for each environmental medium/matrix. Trip blanks will be included for organics shipment as described in Tables 1-1 and 1-2 of the Sampling and Analysis Plan found in Appendix B.

TABLE 2-2 (continued)

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Water Wells (Low)	pH	Acid extractables and base/neutral extractables from CRL	25	1	25	2	1	2	2	1	2
	Specific conductance	Pesticides and PCBs from CRL	25	1	25	2	1	2	2	1	2
	Temperature	Volatile organics from CRL	25	1	25	2	1	2	2	1	2
		Metals from CRL - unfiltered samples	25	1	25	2	1	2	2	1	2
		Cyanide from CRL - unfiltered samples	25	1	25	2	1	2	2	1	2
		Minerals from CRL (acidity, alkalinity, chloride, fluoride, sulfate)	25	1	25	2	1	2	2	1	2
		Nutrients from CRL (ammonia, TKN, nitrate-nitrite, TOC, phosphorous)	25	1	25	2	1	2	2	1	2
1-Wells (Low)	Qualitative organic vapor screening with OVA and HNU	Atterberg Limits (ASTM D 4318-83)	18	1	18	2	1	2	-	-	-
		Particle Size Analysis (ASTM D 422-63) sieve analysis	18	1	18	2	1	2	-	-	-
		Particle Size Analysis (ASTM D 422-63) sieve analysis and hydrometer analysis	18	1	18	2	1	2	-	-	-
		Hydraulic conductivity	6	1	6	-	-	-	-	-	-

a: Field parameters determined for investigative and duplicate samples only.

ASTM methods can be found in American Society of Testing and Materials 1984 Annual Book of Standards, Volume 4.08, Soil and Rock; Building Stones, pgs. 750-765 and pgs. 116-126 respectively. Laboratory testing to be performed by a qualified geotechnical laboratory.

TABLE 2-2 (continued)

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Groundwater (Low)	pH	RAS organics package from CLP including 30 tentatively identified parameters	40	1.5	60	6	1.5	9	6	1.5	
	Specific conductance	RAS inorganics package/metals from CLP filtered samples	40	1.5	60	6	1.5	9	6	1.5	
	Temperature	RAS inorganics package/metals and SAS for suspended solids-unfiltered samples	7	1.5	10	1	1.5	2	1	1.5	
		RAS inorganics package/cyanide from CLP filtered samples	40	1.5	60	6	1.5	9	6	1.5	
Surface Water (Low)	pH	RAS organics package from CLP including 30 tentatively identified parameters	9	1	9	1	1	1	1	1	
	Specific conductance	RAS inorganics package/metals from CLP unfiltered samples	9	1	9	1	1	1	1	1	
	Temperature	RAS inorganics package/metals from CLP unfiltered samples	9	1	9	1	1	1	1	1	
Sediment (Low)	Not applicable	RAS organics package from CLP including 30 tentatively identified parameters	9	1	9	1	1	1	1	1	
		RAS inorganics package/metals from CLP	9	1	9	1	1	1	1	1	
		RAS inorganics package/cyanide from CLP	9	1	9	1	1	1	1	1	

Note: Field parameters determined for investigative and duplicate samples only.

TABLE 2-2 (continued)

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples			Blank		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Natural Soils- Waste Borings (Medium)	Qualitative organic vapor screening with OVA and HMu	RAS organics package from CLP including 30 tentatively identified parameters	8	1	8	1	1	1	1	1	1	1	1	1
		RAS inorganics package/metals from CLP	8	1	8	1	1	1	1	1	1	1	1	1
		RAS inorganics package/cyanide from CLP	8	1	8	1	1	1	1	1	1	1	1	1
Soil Areas (Low)	Qualitative organic vapor screening with OVA and HMu	RAS organics package from CLP including 30 tentatively identified parameters	16	1	16	2	1	2	2	1	2	2	1	2
		RAS inorganics package/metals from CLP	16	1	16	2	1	2	2	1	2	2	1	2
		RAS inorganics packag/cyanide from CLP	16	1	16	2	1	2	2	1	2	2	1	2
Soil Borings (Low)	Qualitative organic vapor screening with OVA and HMu	RAS organics package from CLP including 30 tentatively identified parameters	18	1	18	2	1	2	2	1	2	2	1	2
		RAS inorganics package/metals from CLP	18	1	18	2	1	2	2	1	2	2	1	2
		RAS inorganics package/cyanide from CLP	18	1	18	2	1	2	2	1	2	2	1	2

Note: Field parameters determined for investigative and duplicate samples only.

TABLE 2-2

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Site Pits (High)	Qualitative organic vapor screening with OVA and HNu	RAS high hazard sample preparation by HSL for following by SAS:	18	1	18	2	1	2	2	1	2
		RAS organics parameters including 30 tentatively identified parameters	18	1	18	2	1	2	2	1	2
		RAS inorganics parameters/metals	18	1	18	2	1	2	2	1	2
		RAS inorganics parameters/cyanide	18	1	18	2	1	2	2	1	2
Agricultural Soils - Site Pits (Medium)	Qualitative organic vapor screening with OVA and HNu	RAS organics package from CLP including 30 tentatively identified parameters	6	1	6	1	1	1	1	1	1
		RAS inorganics package/metals from CLP	6	1	6	1	1	1	1	1	1
		RAS inorganics package/cyanide from CLP	6	1	6	1	1	1	1	1	1
Site Borings (High)	Qualitative organic vapor screening with OVA and HNu	RAS high hazard sample preparation by HSL for following by SAS:	34	1	34	3	1	3	3	1	3
		RAS organics parameters including 30 tentatively identified parameters	34	1	34	3	1	3	3	1	3
		RAS inorganics parameters/metals	34	1	34	3	1	3	3	1	3
		RAS inorganics parameters/cyanide	34	1	34	3	1	3	3	1	3

e: Field parameters determined for investigative and duplicate samples only.

SECTION 3

PROJECT ORGANIZATION AND RESPONSIBILITY

Camp Dresser & McKee (CDM), as prime contractor, has overall responsibility for all phases of the RI/FS at the American Chemical Service, Inc. (ACS) site. Roy F. Weston, Inc. (RFW) is a REM II subcontractor to CDM. Weston will perform the field investigations and prepare the RI report. Weston will also perform the development, screening and evaluation of remedial action alternatives; develop the conceptual design of the selected action; and prepare the related reports. CDM will provide administrative oversight and QA/QC for all deliverables. Clement Associates, Inc., which is also a REM II subcontractor to CDM, will provide specialty services in the areas of endangerment assessment. All three firms will provide project management as appropriate to their responsibilities. All deliverables will be issued by CDM.

3.1 OPERATIONAL RESPONSIBILITY

Operational responsibilities are those involving execution and direct management of the technical and administrative aspects of this project. The following responsibilities have been assigned for the RI/FS at American Chemical Service, Inc. (ACS):

- o Remedial Project Manager (RPM)
Rodney Gaither, U.S. EPA, Region V
- o REM II Region V Manager
John W. Hawthorne, REM II, CDM
- o Site Manager
James M. Burton, REM II, RFW
- o Field Manager
James M. Burton, REM II, RFW
- o Principal Investigator RI
Edward A. Need, REM II, RFW
- o Principal Investigator FS
R. Michael Bort, REM II, RFW
- o Principal Investigator Conceptual Design
Michael H. Corbin, REM II, RFW

- o Principal Investigator Risk Assessment
Dr. Ian T. Nesbit, REM II, Clement Assoc.

3.2 LABORATORY RESPONSIBILITIES

Laboratory responsibilities are those involving the performance of analytical services, the preparation of Special Analytical Services (SAS) requests and/or field laboratory procedures, and the assessment of analytical data including review of tentatively identified compounds. The following responsibilities have been assigned for the RI/FS at American Chemical Service, Inc. (ACS):

- o RAS and SAS from Contract Laboratory Program
Charles T. Elly, U.S. EPA, Region V, CPSM-CRL
- o Analysis of Water Supply Samples
Central Regional Laboratory
Curtis Ross, U.S. EPA, Region V, CRL-Director
- o Geotechnical Laboratory
Unassigned
- o Preparation of SAS Requests
Edward A. Need, REM II, RFW
- o Data Assessment for RAS and SAS from CLP
Contract Program Management Section, CRL
- o Data Assessment of Analytical Services from CRL
QC Coordinator, CRL
- o Data Assessment for Geotechnical Laboratory
Edward A. Need, REM II, RFW
- o Review of Tentatively Identified Compounds
Dr. James Smith, REM II, RFW
Edward A. Need, REM II, RFW

3.3 QA RESPONSIBILITY

Quality Assurance (QA) responsibilities are those involved with monitoring and reviewing the procedures used to perform all aspects of this project including data collection, analytical services, and report preparation. Primary responsibility for project quality rests with the Site Manager. Ultimate responsibility for project quality rests with CDM. Prior to any QA review by CDM, any work performed by the REM II subcontract firms--Weston and Clement Associates will

be reviewed by the QA Reviewer for that firm. Specific QA responsibilities for the RI/FS at American Chemical Service, Inc. (ACS) have been assigned as follows:

- o Overall QA for REM II Activities
John W. Hawthorne, REM II, CDM
- o Overall QA for CLP/CRL Activities
Quality Assurance Office, U.S. EPA, Region V
- o QA for Field Activities
James M. Burton, REM II, RFW
- o QA for RAS from CLP
Support Services Branch, OERR, EPA HQ
EMSL Las Vegas
Contract Program Management Section, CRL
- o QA for SAS from CLP
Quality Assurance Office, U.S. EPA, Region V
- o QA for Analytical Services from CRL
QC Coordinator, CRL
Quality Assurance Office, U.S. EPA, Region V
- o Performance and Systems Audits of RAS from CLP
U.S. EPA, EMSL-Las Vegas
- o Performance and Systems Audits of CRL
Quality Assurance Office, U.S. EPA, Region V
QC Coordinator, CRL
- o Systems Audit of Field Activities
Robert J. Karnauskas, REM II, RFW
- o Systems Audit of Geotechnical Laboratory
Edward A. Need, REM II, RFW
- o CDM QA Review
John W. Hawthorne, REM II, CDM
National Program Management Office, REM II, CDM
- o RFW QA Review
Glenn Johnson, REM II, RFW
- o Clement Associates QA Review
Jay Turim, REM II, Clement
- o QA/QC Summaries for Revised RI and FS/CD Reports
James M. Burton, REM II, RFW

SECTION 4

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis and reporting that will provide legally defensible results in a court of law. Specific procedures to be used for sampling, chain of custody, calibration, laboratory analysis, reporting, internal quality control, audits, preventative maintenance and corrective actions are described in other sections of this Quality Assurance Project Plan. This section defines the goals for level of QA effort; accuracy, precision and sensitivity of analyses; and completeness, representativeness, and comparability of measurement data from all analytical laboratories. QA objectives for field measurements are also discussed.

4.1 REGULATORY AND LEGAL REQUIREMENTS

The data used to evaluate compliance with the National Interim Primary Drinking Water Standards should have method detection limits that are less than 20 percent of the maximum allowable levels on a parameter by parameter basis. The standard method detection limits for analytical services from the CRL meet this criteria for the required inorganic and organic parameters. The CRL method detection limits are presented below in Subsection 4.3.

4.2 LEVEL OF QA EFFORT

Field duplicates and field blanks will be taken and submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Blank samples will be analyzed to check for procedural contamination and/or ambient conditions at the site which are causing sample contamination.

The general level of this QA effort will be one field duplicate and one field blank for every 10 investigative samples. Soil samples selected for geotechnical testing will include one field duplicate for each analysis being performed but no blanks. Trip blanks will be included for organics shipments as described in Tables 1-1 and 1-2 of the Sampling and Analysis Plan found in Appendix B. The specific level of field QA effort for the American Chemical Service, Inc. (ACS) RI/FS, itemized by sample matrix and parameter, is shown in Table 2-2.

The waste, surface water, sediment, soil and groundwater samples collected at the site will be analyzed using the Contract Laboratory Program (CLP). The level of laboratory QA effort for Routine Analytical Services (RAS) provided by the CLP is specified in the Invitations for Bid (IFBs), WA84-A266/A267 for organics and WA84-J091/J092 for inorganics. Extracts of high hazard samples to be tested by SAS for RAS organics and inorganics parameters will use the same QA effort. Samples collected from private wells will be analyzed at the Central Regional Laboratory (CRL). The level of laboratory QA for the CRL is summarized in Table 4-1. The level of laboratory QA effort for SAS of total suspended solids are described in the individual SAS request forms which are attached in Appendix C.

Laboratory QA for the geotechnical testing will require that all equipment used to perform the analyses be calibrated not more than 6 months prior to actual testing, that all solutions be not more than 1 month old, and that all calculations be checked by someone other than the person performing the actual testing. The geotechnical laboratory will also be required to test one laboratory duplicate for each type of analysis performed.

4.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for RAS from the CLP are specified in the IFBs, WA84-A266/A267 for organics and WA84-J091/J092 for inorganics. The sensitivities required for CLP analyses will be the method detection limits, shown in Tables 4-2 and 4-3, from the same IFBs. Extracts of high hazard samples to be tested by SAS for RAS organics and inorganics parameters will use the same accuracy, precision and sensitivity criteria.

The accuracy and precision criteria for analytical services from the CRL for organics and inorganics are shown in Tables 4-4 and 4-5 respectively. These QC control limits should be completely met without any outliers. If an out-of-control result occurs and the QC Coordinator of the CRL does not believe it necessary to rerun the sample, the result will be flagged and a memorandum written regarding the utility of the data. The sensitivities required for CRL analyses are the method detection limits shown in Tables 4-6 and 4-7. The accuracy and precision requirements for SAS of total suspended solids are described in the individual SAS request forms which are attached in Appendix C.

The geotechnical data will be considered accurate if the QA criteria with respect to equipment, solutions and calculations are met, and if adherence to appropriate methods can be documented during a systems

Table 4-1

QA LEVEL OF EFFORT FOR ORL ANALYTICAL SERVICES

<u>Parameter</u>	<u>Lab Blanks</u>	<u>Spikes or Surrogates</u>	<u>Lab Duplicates</u>	<u>Reference Samples</u>
Base/Neutral/Acid Compounds	One per set of samples or a minimum of 1 in 10	Surrogates added to each sample and matrix spikes added to one sample per set	One per set of samples or a minimum of 1 in 10	Quarterly
Volatiles	One per day or 8 hours shift	Surrogates added to each sample and matrix spikes added to one sample per set	One per set of samples or a minimum of 1 in 10	Quarterly
Pesticides and PCB's	One per set of samples or a minimum of 1 in 10	One spike per set of samples or a minimum of 1 in 10	One per set of samples or a minimum of 1 in 10	Quarterly
Metals	One per 10 samples	One per 10 samples	One per 10 samples	Quarterly
Cyanide	One per analytical run or at least one per set-up	One per analytical run or at least one per set-up	One per analytical run or at least one per set-up	Quarterly
Acidity	One per 20 samples	NA	One per 20 samples	Quarterly
Alkalinity	One per 20 samples	NA	One per 20 samples	Quarterly
Chloride	One at beginning, one at end, and one per 40 samples	One per 40 samples	One per 40 samples	Quarterly
Fluoride	One at beginning, one at end, and one per 20 samples	One per 20 samples	One per 20 samples	Quarterly

Table 4-1 (continued)

QA LEVEL OF EFFORT FOR CRL ANALYTICAL SERVICES

<u>Parameter</u>	<u>Lab Blanks</u>	<u>Spikes or Surrogates</u>	<u>Lab Duplicates</u>	<u>References Samples</u>
Sulfate	One at beginning, one at end, and one per 40 samples	One per 40 samples	One per 40 samples	Quarterly
Ammonia Nitrogen	One per set of samples or at least one per 20 samples	One spike per set of samples or at least one per 20 samples	One per set of samples or at least one per 20 samples	Quarterly
TKN	One at beginning, one at end, and one per 40 samples	One per 40 samples	One per 40 samples	Quarterly
Nitrate and Nitrite	One per set of samples or at least one per 20 samples	One spike per set of samples or at least one per 20 samples	One per set of samples or at least one per 20 samples	Quarterly
TOC	One at beginning, one at end, and one per 20 samples	One per 20 samples	One per 20 samples	Quarterly
Total Phosphorous	One at beginning, one at end, and one per 20 samples	One per 20 samples	One per 20 samples	Quarterly

Table 4-2

METHOD DETECTION LIMITS FOR RAS ORGANICS FROM CLP

Volatiles	CAS Number	Detection Limits*	
		Low Water ^a ug/L	Low Soil/Sediment ^b ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-35-3	5	5
10. trans-1,2-Dichloroethene	156-60-5	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
19. 1,2-Dichloropropane	78-87-5	5	5
20. trans-1,3-Dichloropropene	10061-02-6	5	5
21. Trichloroethene	79-01-6	5	5
22. Dibromochloromethane	124-48-1	5	5
23. 1,1,2-Trichloroethane	79-00-5	5	5
24. Benzene	71-43-2	5	5
25. cis-1,3-Dichloropropene	10061-01-5	5	5
26. 2-Chloroethyl Vinyl Ether	110-75-8	10	10
27. Bromoform	75-25-2	5	5
28. 2-Hexanone	591-78-6	10	10
29. 4-Methyl-2-pentanone	108-10-1	10	10
30. Tetrachloroethene	127-18-4	5	5
31. Toluene	108-88-3	5	5
32. Chlorobenzene	108-90-7	5	5
33. Ethyl Benzene	100-41-4	5	5
34. Styrene	100-42-5	5	5
35. Total Xylenes		5	5

^aMedium Water Contract Required Detection Limits (CRDL) for Volatile HSL
Compounds are 100 times the individual Low Water CRDL.

^bMedium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile
HSL Compounds are 100 times the individual Low Soil/Sediment CRDL.

Table 4-2 (continued)

METHOD DETECTION LIMITS FOR RAS ORGANICS FROM CLP

Semi-Volatiles	CAS Number	Detection Limits*	
		Low Water ^c ug/L	Low Soil/Sediment ^c ug/Kg
36. N-Nitrosodimethylamine	62-75-9	10	330
37. Phenol	108-95-2	10	330
38. Aniline	62-53-3	10	330
39. bis(2-Chloroethyl) ether	111-44-4	10	330
40. 2-Chlorophenol	95-57-8	10	330
41. 1,3-Dichlorobenzene	541-73-1	10	330
42. 1,4-Dichlorobenzene	106-46-7	10	330
43. Benzyl Alcohol	100-51-6	10	330
44. 1,2-Dichlorobenzene	95-50-1	10	330
45. 2-Methylphenol	95-48-7	10	330
46. bis(2-Chloroisopropyl) ether	39638-32-9	10	330
47. 4-Methylphenol	106-44-5	10	330
48. N-Nitroso-Dipropylamine	621-64-7	10	330
49. Hexachloroethane	67-72-1	10	330
50. Nitrobenzene	98-95-3	10	330
51. Isophorone	78-59-1	10	330
52. 2-Nitrophenol	88-75-5	10	330
53. 2,4-Dimethylphenol	105-67-9	10	330
54. Benzoic Acid	65-85-0	50	1600
55. bis(2-Chloroethoxy) methane	111-91-1	10	330
56. 2,4-Dichlorophenol	120-83-2	10	330
57. 1,2,4-Trichlorobenzene	120-82-1	10	330
58. Naphthalene	91-20-3	10	330
59. 4-Chloroaniline	106-47-8	10	330
60. Hexachlorobutadiene	87-68-3	10	330
61. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
62. 2-Methylnaphthalene	91-57-6	10	330
63. Hexachlorocyclopentadiene	77-47-4	10	330
64. 2,4,6-Trichlorophenol	88-06-2	10	330
65. 2,4,5-Trichlorophenol	95-95-4	50	1600
66. 2-Chloronaphthalene	91-58-7	10	330
67. 2-Nitroaniline	88-74-4	50	1600
68. Dimethyl Phthalate	131-11-3	10	330
69. Acenaphthylene	208-96-8	10	330
70. 3-Nitroaniline	99-09-2	50	1600

Table 4-2 (continued)

METHOD DETECTION LIMITS FOR RAS ORGANICS FROM CLP

Semi-Volatiles	CAS Number	Detection Limits*	
		Low Water ^c ug/L	Low Soil/Sediment ^d ug/Kg
71. Acenaphthene	83-32-9	10	330
72. 2,4-Dinitrophenol	51-28-5	50	1600
73. 4-Nitrophenol	100-02-7	50	1600
74. Dibenzofuran	132-64-9	10	330
75. 2,4-Dinitrotoluene	121-14-2	10	330
76. 2,6-Dinitrotoluene	606-20-2	10	330
77. Diethylphthalate	84-66-2	10	330
78. 4-Chlorophenyl Phenyl ether	7005-72-3	10	330
79. Fluorene	86-73-7	10	330
80. 4-Nitroaniline	100-01-6	50	1600
81. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
82. N-nitrosodiphenylamine	86-30-6	10	330
83. 4-Bromophenyl Phenyl ether	101-55-3	10	330
84. Hexachlorobenzene	118-74-1	10	330
85. Pentachlorophenol	87-86-5	50	1600
86. Phenanthrene	85-01-8	10	330
87. Anthracene	120-12-7	10	330
88. Di-n-butylphthalate	84-74-2	10	330
89. Fluoranthene	206-44-0	10	330
90. Benzidine	92-87-5	100	1600
91. Pyrene	129-00-0	10	330
92. Butyl Benzyl Phthalate	85-68-7	10	330
93. 3,3'-Dichlorobenzidine	91-94-1	20	660
94. Benzo(a)anthracene	56-55-3	10	330
95. bis(2-ethylhexyl)phthalate	117-81-7	10	330
96. Chrysene	218-01-9	10	330
97. Di-n-octyl Phthalate	117-84-0	10	330
98. Benzo(b)fluoranthene	205-99-2	10	330
99. Benzo(k)fluoranthene	207-08-9	10	330
100. Benzo(a)pyrene	50-32-8	10	330
101. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
102. Dibenz(a,h)anthracene	53-70-3	10	330
103. Benzo(g,h,i)perylene	191-24-2	10	330

^cMedium Water Contract Required Detection Limits (CRDL) for Semi-Volatile HSL Compounds are 100 times the individual Low Water CRDL.

^dMedium Soil/Sediment Contract Required Detection Limits (CRDL) for Semi-Volatile HSL Compounds are 60 times the individual Low Soil/Sediment CRDL.

Table 4-2 (continued)

METHOD DETECTION LIMITS FOR PAS ORGANICS FROM CLP

Pesticides	CAS Number	Detection Limits*	
		Low Water ^e ug/L	Low Soil/Sediment ^f ug/Kg
104. alpha-BHC	319-84-6	0.05	2.0
105. beta-BHC	319-85-7	0.05	2.0
106. delta-BHC	319-86-8	0.05	2.0
107. gamma-BHC (Lindane)	58-89-9	0.05	2.0
108. Heptachlor	76-44-8	0.05	2.0
109. Aldrin	309-00-2	0.05	2.0
110. Heptachlor Epoxide	1024-57-3	0.05	2.0
111. Endosulfan I	959-98-8	0.05	2.0
112. Dieldrin	60-57-1	0.10	4.0
113. 4,4'-DDE	72-55-9	0.10	4.0
114. Endrin	72-20-8	0.10	4.0
115. Endosulfan II	33213-65-9	0.10	4.0
116. 4,4'-DDD	72-54-8	0.10	4.0
117. Endrin Aldehyde	7421-93-4	0.10	4.0
118. Endosulfan Sulfate	1031-07-8	0.10	4.0
119. 4,4'-DDT	50-29-3	0.10	4.0
120. Endrin Ketone	53494-70-5	0.10	4.0
121. Methoxychlor	72-43-5	0.5	20.0
122. Chlordane	57-74-9	0.5	20.0
123. Toxaphene	8001-35-2	1.0	40.0
124. AROCLOR-1016	12674-11-2	0.5	20.0
125. AROCLOR-1221	11104-28-2	0.5	20.0
126. AROCLOR-1232	11141-16-5	0.5	20.0
127. AROCLOR-1242	53469-21-9	0.5	20.0
128. AROCLOR-1248	12672-29-6	0.5	20.0
129. AROCLOR-1254	11097-69-1	1.0	40.0
130. AROCLOR-1260	11096-82-5	1.0	40.0

^eMedium Water Contract Required Detection Limits (CRDL) for Pesticide HSL Compounds are 100 times the individual Low Water CRDL.

^fMedium Soil/Sediment Contract Required Detection Limits (CRDL) for Pesticide HSL compounds are 60 times the individual Low Soil/Sediment CRDL.

*Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

** Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

Table 4-3

METHOD DETECTION LIMITS FOR RAS INORGANICS FROM CLP

Element	Contract Required Detection Level ^{1,2} (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Tin	40
Vanadium	50
Zinc	20
Cyanide	10

- 1: Any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Level (CRDL) requirements. Higher detection levels may only be used in the following circumstance:

If the sample concentration exceeds two times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the contract required detection level.

- 2: These CRDL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix.

Table 4-4

ACCURACY AND PRECISION CRITERIA FOR ORGANICS FROM CRL

<u>Parameter</u>	<u>Audit</u>	<u>Compounds</u>	<u>Control Limits</u>
Base/Neutral/Acid Compounds	Lab Blank	--	± d.l.
	Matrix Spike Duplicate Precision	--	<38% RPD (95% CI)
Surrogate Spike Recovery		D ₅ -phenol	10-86% (95% CI)
		2 ⁵ -fluorophenol	10-103%
		2,4,6-tribromophenol	43-105%
		D ₅ -nitrobenzene	29-107%
		2 ⁵ -fluorobiphenyl	25-119%
		D ₁₄ -terphenyl	42-112%
Matrix Spike Recovery		phenol	10-121% (95% CI)
		2-chlorophenol	10-140%
		1,4-dichlorobenzene	10-102%
		Benzyl alcohol	10-124%
		n-nitrosodipropylamine	12-127%
		1,2,4-trichlorobenzene	12-124%
		4-chloraniline	10-100%
		p-chloro-m-cresol	10-130%
		acenaphthene	38-119%
		dibenzofuran	45-112%
		2,4-dinitrotoluene	31-136%
		4-nitrophenol	17-128%
		pentachlorophenol	10-105%
		Di-n-butyl phthalate	39-136%
		pyrene	43-127%
		1,3-dichlorobenzene	28-108%
		2,6-dinitrotoluene	47-155%

Table 4-4 (continued)

ACCURACY AND PRECISION CRITERIA FOR ORGANICS FROM CRL

<u>Parameter</u>	<u>Audit</u>	<u>Compounds</u>	<u>Control Limits</u>
Volatiles	Lab Blank	--	± d.l.
	Matrix Spike Duplicate Precision	--	<17% RPD (95% CI)
	Surrogate Spike Recovery	D ₄ -1,2-dichloroethane D ₆ -benzene D ₈ -toluene	85-115% (95% CI) 87-113% 82-115%
	Matrix Spike Recovery	benzene 1,2-dichloroethane 1,1,1-trichloroethane trans-1,2-dichloroethane trans-1,2-dichloropropene cis-1,2-dichloropropene ethyl benzene toluene 1,1,2,2-tetrachloroethane bromoform	87-118% (95% CI) 91-118% 85-125% 87-126% 86-122% 86-120% 81-121% 81-120% 89-133% 98-130%
Pesticides & PCB's	Lab Blank	--	± d.l.
	Lab Duplicate	--	±35% RPD (95% CI at level >1 ppb)
	Matrix Spike Recovery	Aroclor 1242 endrin lindane methoxychlor toxaphene aldrin dieldrin 4,4'-DDD 4,4'-DDE 4,4'-DDT heptochlor chlordan	60-122% (95% CI) 69-119% 62-118% 71-139% 62-134% 50-104% 79-126% 70-112% 59-131% 66-117% 62-124% 65-129%

Table 4-5

ACCURACY AND PRECISION CRITERIA FOR INORGANICS FROM CRL

<u>Parameter</u>	<u>Audit</u>	<u>Control Limits</u>
Arsenic, Lead & Selenium	Lab Blank	+ d.l.
	Lab Control Standard	+10% of true value of WS776 No. 2
	Lab Duplicates	+ d.l. or +10% RPD
	Lab Spikes	85 - 115%
Mercury	Lab Blank	≤ 0.1 ug/L
	Lab Duplicates	$\Delta \leq 0.1$ ug/L or +10% RPD
	Lab Spikes	85 - 115%
Antimony & Thallium	Lab Blank	+ d.l.
	Lab Control Standard	+10% of true value of WP379 No.1
	Lab Duplicates	+ d.l. or +10% RPD
Aluminum, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Nickel, Silver, Tin, Vanadium, Zinc	Lab Blank	+ d.l.
	Lab Duplicates	+ d.l. or +10% RPD
	Lab Spikes	90 - 110%
Cyanide	Distilled Standard	91 +15%
	Distilled Blank	≤ 8 ug/L
	Distilled Duplicate	$\Delta \leq 8$ ug/L or +7% RPD
	Distilled Spike	91 +15%*
Alkalinity	Lab Blank	≤ 5 mg/L
	Lab Duplicate	$\Delta \leq 5$ mg/L or $\leq 5\%$ RPD
Chloride	Lab Blank	≤ 3 mg/L
	Lab Duplicate	$\Delta \leq 1.6$ mg/L or $\leq 4.6\%$ RPD
	Lab Spike	97 +8%

*This limit applies to results that are within the working range (5 - 200 ug/L).

Table 4-5 (continued)

ACCURACY AND PRECISION CRITERIA FOR INORGANICS FROM CRL

<u>Parameter</u>	<u>Audit</u>	<u>Control Limits</u>
Fluoride	Lab Blank	≤ 0.1 mg/L
	Lab Duplicate	$\Delta \leq 0.1$ mg/L or $\leq 10\%$ RPD
	Lab Spike	$95 \pm 16\%$
Sulfate	Lab Blank	≤ 4 mg/L
	Lab Duplicate	$\Delta \leq 6$ mg/L or $\leq 4.6\%$ RPD
	Lab Spike	$98 \pm 9\%$
Ammonia Nitrogen	Lab Blank	≤ 0.04 mg/L
	Control Standard 1	0.99 ± 0.11 mg/L
	Control Standard 2	5.05 ± 0.32 mg/L
	Lab Duplicates	$\Delta \leq 0.07$ mg/L or $\leq 1.4\%$ RPD
	Lab Spikes	$99 \pm 7\%$
TKN	Lab Blank	≤ 0.1 mg/L
	Lab Duplicate	$\Delta \leq 0.12$ mg/L or $\leq 7\%$ RPD
	Lab Spike	$96 \pm 10\%$
Nitrate and Nitrite	Lab Blank	≤ 0.07 mg/L
	Control Standard 1	0.94 ± 0.08 mg/L
	Control Standard 2	4.92 ± 0.03 mg/L
	Lab Duplicates	$\Delta \leq 0.04$ mg/L or $\leq 3.3\%$ RPD
	Lab Spikes	$96 \pm 6\%$
TOC	Lab Blank	≤ 3 mg/L
	Lab Duplicate	$\Delta \leq 5$ mg/L or $\leq 5\%$ RPD
	Lab Spike	$96 \pm 14\%$
Total Phosphorous	Lab Blank	≤ 0.05 mg/L
	Lab Duplicate	$\Delta \leq 0.04$ mg/L or $\leq 9.8\%$ RPD
	Lab Spike	$101 \pm 5\%$

Note: Δ = absolute difference between duplicates; RPD = relative percent difference.

Table 4-6

METHOD DETECTION LIMITS FOR ORGANICS FROM CRL

Volatile Compounds

PP No.	CAS No.	Compound	Detection Limit (ug/L)
(45V)	74-87-3	chloromethane	4.4
(46V)	74-83-9	bromomethane	.7
(88V)	75-01-4	vinyl chloride	1.7
(16V)	75-00-3	chloroethane	1.5
(44V)	75-09-2	methylene chloride	.5
(2V)	107-02-8	acrolein	26
	67-64-1	acetone	75
(3V)	107-13-1	acrylonitrile	21
	75-15-0	carbonyl sulfide	.4
(29V)	75-35-4	1,1-dichloroethene	.5
(13V)	75-34-3	1,1-dichloroethane	.5
(30V)	156-60-5	trans-1,2-dichloroethene	.5
(23V)	67-66-3	chloroform	.5
	78-93-3	2-butanone	45
(10V)	107-06-2	1,2-dichloroethane	.5
(11V)	71-55-6	1,1,1-trichloroethane	.5
(6V)	56-23-5	carbon tetrachloride	.5
	108-05-4	vinyl acetate	2.0
(48V)	75-27-4	bromodichloromethane	.5
(32V)	78-87-5	1,2-dichloropropane	.5
(33V)	10061-02-6	trans-1,3-dichloropropene	.5
(87V)	79-01-6	trichloroethene	.5
(4V)	71-43-2	benzene	.5
(51V)	124-48-1	chlorodibromomethane	.5
(14V)	79-00-5	1,1,2-trichloroethane	.5
	10061-01-05	cis-1,3-dichloropropene	.5
(19V)	110-75-8	2-chloroethylvinyl ether	.5
(47V)	75-25-2	bromoform	.5
	108-10-1	4-methyl-2-pentanone	
	519-78-6	2-hexanone	57
(85V)	127-18-4	tetrachloroethene	.5
(15V)	79-34-5	1,1,2,2-tetrachloroethane	.5
(86V)	108-88-3	toluene	.5
(7V)	108-90-7	chlorobenzene	.5
(38V)	100-41-4	ethylbenzene	.5
	100-42-5	styrene	.5
		m-xylene	.5
	95-47-6	o-xylene, p-xylene	.5

Table 4-6 (continued)

METHOD DETECTION LIMITS FOR ORGANICS FROM CRL

Base/Neutral and Acid Extractable Compounds

<u>PP No.</u>	<u>CAS No.</u>	<u>Compound</u>	<u>Detection Limit (ug/L)</u>
	62-53-3	aniline	.5
(18B)	111-44-4	bis (2-chloroethyl) ether	.5
(65A)	108-95-2	phenol	.5
(24A)	95-57-8	2-chlorophenol	.5
(26B)	541-73-1	1,3-dichlorobenzene	.5
(27B)	106-46-7	1,4-dichlorobenzene	.5
(25B)	95-50-1	1,2-dichlorobenzene	.5
	100-51-6	benzyl alcohol	.5
(42B)	118-60-1	bis (2-chloroisopropyl) ether	.5
	95-48-7	2-methylphenol	.5
(12B)	67-72-1	hexachloroethane	1.0
(63B)	621-64-7	N-nitrosodipropylamine	.5
(56B)	98-95-3	nitrobenzene	.5
	108-39-4	4-methylphenol	.5
(54B)	78-59-1	isophorone	.5
(57A)	88-75-5	2-nitrophenol	3.0
(34A)	105-67-9	2,4-dimethylphenol	.5
(43B)	111-91-1	bis (2-chloroethoxy) methane	.5
(31A)	120-83-2	2,4-dichlorophenol	.5
(8B)	120-82-1	1,2,4-trichlorobenzene	.5
(55B)	91-20-3	naphthalene	.5
	106-47-8	4-chloroaniline	.5
(52B)	87-68-3	hexachlorobutadiene	1.0
	65-85-0	benzoic acid	3.0
	91-57-6	2-methylnaphthalene	.5
(22A)	59-50-7	p-chloro-m-cresol	.5
(53B)	77-47-4	hexachlorocyclopentadiene	1.5
	95-95-4	2,4,5-trichlorophenol	1.0
(21A)	88-06-2	2,4,6-trichlorophenol	1.0
(20B)	91-58-7	2-chloronaphthalene	.5
(77B)	208-96-8	acenaphthylene	.5
(71B)	131-11-3	dimethyl phthalate	.5
(36B)	606-20-2	2,6-dinitrotoluene	1.5
(1B)	83-32-9	acenaphthene	.5
	99-09-2	3-nitroaniline	1.5
	132-64-9	dibenzofuran	.5
(59A)	51-28-5	2,4-dinitrophenol	10.0
(35B)	121-14-2	2,4-dinitrotoluene	1.5
(80B)	86-73-7	fluorene	.5
(58A)	100-02-7	4-nitrophenol	3.0
(40B)	7005-72-3	4-chlorophenyl phenyl ether	.5
(70B)	84-66-2	diethyl phthalate	.5
(60A)	534-52-1	4,6-dinitro-2-methylphenol	6.0
(37B)	122-66-7	1,2-diphenylhydrazine (azobenzene)	.5
(62B)	86-30-6	N-nitrosodiphenylamine (diphenylamine)	.5
	100-01-6	4-nitroaniline	4.0
(41B)	101-55-3	4-bromophenyl phenyl ether	1.5

Table 4-6 (continued)

METHOD DETECTION LIMITS FOR ORGANICS FROM CRL

PP No.	CAS No.	Compound	Limit (ug/L)
(9B)	118-74-1	hexachlorobenzene	1.0
(64A)	87-86-5	pentachlorophenol	4.0
(81B)	85-01-8	phenanthrene	.5
(78B)	120-12-7	anthracene	.5
(68B)	84-74-2	di-n-butyl phthalate	.5
(39B)	206-44-0	fluoranthene	.5
(84B)	129-00-0	pyrene	.5
(67B)	85-68-7	butyl benzyl phthalate	2.0
(76B)	218-01-9	chrysene	1.0
(72B)	56-55-3	benzo(a)anthracene	1.0
(66B)	117-81-7	bis (2-ethylhexyl) phthalate	1.0
(69B)	117-84-0	di-n-octyl phthalate	1.0
(74B)	205-99-2	benzo(b)fluoranthene	1.0
(75B)	207-08-9	benzo(k)fluoranthene	1.0
(73B)	50-32-8	benzo(a)pyrene	1.5
(83B)	193-39-5	indeno(1,2,3-cd)pyrene	2.5
(82B)	53-70-3	dibenzo(a,h)anthracene	2.5
(79B)	191-24-2	benzo(ghi)perylene	2.5
(5B)	92-87-5	benzidine	a
(28B)	91-94-1	3,3'-dichlorobenzidine	a
	88-74-4	2-nitroaniline	a

Pesticides and PCBs

CAS No.	Compound	Detection Limit (ug/L)
319-85-7	α BHC	.003
53469-21-9	γ BHC (Lindane)	.004
319-86-8	β BHC	.006
1024-57-3	heptachlor	.003
58-89-9	δ-BHC	.009
60-57-1	aldrin	.004
319-84-6	heptachlor epoxide	.083
115-29-7	endosulfan I	.014
72-54-8	P.P'-DDE	.004
57-74-9	dieldrin	.002
7421-93-4	endrin	.006
115-29-7	P.P'-DDD	.011
1031-07-8	endosulfan II	.004
72-55-9	P.P'-DDT	.012
50-29-3	chlordan	.014
	toxaphene	.24
	methoxychlor	.004
8001-35-2	aroclor 1016	.05
11097-69-1	aroclor 1242	.05
11096-82-5	aroclor 1248	.05
11104-28-2	aroclor 1254	.05
12674-11-2	aroclor 1260	.05

a Not reported

Table 4-7

METHOD DETECTION LIMITS FOR INORGANICS FROM ORL

<u>Parameter</u>	<u>Detection Limit (ug/L)</u>
Aluminum	80
Chromium	8
Barium	5
Beryllium	1
Cobalt	6
Copper	6
Iron	80
Nickel	15
Manganese	5
Zinc	40
Boron	80
Vanadium	5
Silver	3
Arsenic	2
Antimony	2
Selenium	2
Thallium	2
Mercury	.1
Tin	40
Cadmium	2
Lead	2
Cyanide	5
Alkalinity (CaCO ₃)	5000
Chloride	3000
Fluoride	100
Sulfate	4000
Ammonia Nitrogen	30
TKN	100
Nitrate and Nitrite	30
TOC	3000
Total Phosphorous	50

audit. The precision of these data will be assessed using the duplicate results, but no quantitative criteria have been established. The geotechnical data will be adequately sensitive if adherence to appropriate methods can be documented during a systems audit.

4.4 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that the CLP and the laboratories performing analyses of high hazard extracts will provide data meeting QC acceptance criteria for 95 percent of all samples tested. Completely valid data are required for samples designated in the Sampling and Analysis Plan (Appendix B) as "background samples." The CRL, SAS, and geotechnical laboratories should provide completely valid data, and the reasons for any variances from 100 percent completeness will be documented in writing.

The sampling network was designed to provide data representative of site conditions. During development of this network consideration was given to past waste storage and disposal practices, existing analytical data, remedial activities to date, physical setting and processes, and constraints inherent to the Superfund program. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are documented in this QAPP. It may be necessary to verify similar documentation for existing analytical data.

4.5 FIELD MEASUREMENTS

Measurement data will be generated in many field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to, the following:

- o Documenting time and weather conditions.
- o Locating and determining the elevation of sampling stations.
- o Performing geophysical surveys.
- o Calculating flow rates for stormwater or surface water.
- o Determining pH, specific conductance and temperature of water samples.
- o Qualitative organic vapor screening of soil samples using an OVA and/or HNu.
- o Determining depths in a borehole or well.
- o Standard penetration testing.

- o Calculating pumping rates.
- o Verifying well development and pre-sampling purge volumes.
- o Performing bail-down recovery tests.

The general QA objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through the documented use of standardized procedures. The procedures for performing these activities and the standardized formats for documenting them are presented in the Sampling and Analysis Plan (Appendix B).

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SECTION 5

SAMPLING PROCEDURES

The procedures for collecting samples and for performing all related field activities are described in detail in the Sampling and Analysis Plan, which is attached in full as Appendix B.

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SECTION 6

SAMPLE CUSTODY

Region V, U.S. EPA sample custody (chain-of-custody) protocols are described in "NEIC Policies and Procedures." EPA-330/9-78-001-R, Revised February 1983. This custody is in three parts: 1) sample collection, 2) laboratory, and 3) final evidence files. Field custody (sample collection) procedures are also described in the Sampling and Analysis Plan (Appendix B); and laboratory procedures for the CLP are also described in the IFBs, WA84-A266/A267 for organics and WA84-J091/J092 for inorganics.

SECTION 7

CALIBRATION PROCEDURES AND FREQUENCY

The calibration procedures and frequency of calibration for RAS from the CLP are specified in the IFBs, WA84-A266/A267 for organics and WA84-J091/J092 for inorganics. The laboratories performing analyses or high hazard extracts for the RAS organics and inorganics parameters will use the same calibration procedures and frequency. Calibration procedures and frequency for analytical services from the CRL are specified for each analytical procedure. Tables 7-1 and 7-2 list the CRL method numbers for analysis of the parameters of interest to this RI/FS.

Calibration of equipment used to perform the geotechnical testing will be in accordance with that specified in the ASTM method descriptions--ASTM D 4318 for Atterberg Limits and ASTM D 422 for hydrometer and sieve analyses. The equipment calibrations, including those for ovens, thermometers and balances, shall be done not more than 6 months prior to actual testing.

Calibration of the OVA and HNu organic vapor detection devices will be done prior to use each day and after every four hours of use. Calibration will be done using reference gases in accordance with manufacturer's specifications, which are referenced in the Sampling and Analysis Plan (Appendix B).

Calibration of the field pH meter will be done prior to the collection of each water sample. The field pH meter will be calibrated using two reference solutions as appropriate to the pH of the sample. The YSI specific-conductance/temperature meter will be calibrated using a reference solution of 0.01 N KCl (specific conductance, 1413 umhos/cm at 25°C) on a daily basis. Readings must be within 5 percent to be acceptable. The thermometer of the YSI meter will be calibrated against the field laboratory thermometer on a weekly basis. Additional information regarding the calibration of these meters can be found in the Sampling and Analysis Plan (Appendix B).

Tape measures used to locate sampling stations and to determine depths in boreholes or wells will be examined prior to each period of sustained use to verify their calibration.

An equipment log sheet will be kept for each piece of equipment. Items to be recorded include date of calibration, next scheduled calibration date, initial of person doing the calibration, record of failure, equipment identification number and any other information deemed necessary.

Table 7-1

ANALYTICAL METHODS FOR ORGANICS ANALYSIS FROM CRL

<u>Parameter</u>	<u>CRL Method Number</u>	<u>CRL Method Designation</u>	<u>Effective Date</u>
Base/Neutral/Acid Compounds	TOX956, TOX957 TOX9561, 9571	GC/MS/DS Analysis of Nonvolatile Organic Compounds	In effect
Volatiles	TOX105631, 105731, 10561, 10571	Analysis of volatile organic com- pounds in fish tissue, sedi- ment, and water samples using GC/MS	In effect
Pesticides & PCB's	PES12621-12691, 12701-12791	Analysis of pesticides, phthalates, and PCB's in Aqueous Media	In effect
<u>Sample Preparation</u>			
Separatory Funnel Liquid-Liquid Extraction	N/A	Analysis of nonvolatile extract- able organic compounds	In effect
Purge and Trap	TOX105631, 105731, 10561, 10571	Analysis of volatile organic com- pounds in fish tissue, sedi- ment, and water samples using GC/MS.	In effect

Table 7-2

ANALYTICAL METHODS FOR INORGANICS ANALYSIS FROM CRL

<u>Parameter</u>	<u>CRL Method Number</u>	<u>CRL Method Designation</u>	<u>Effective Date</u>
Arsenic, Lead & Selenium	MET361, 3191 and 3211	Determination of arsenic lead, and selenium in drinking water (AA- Furnace Technique	In effect
Mercury	MIN74717	Total Mercury (automated persulfate digestion, cold-vapor AA determi- nation)	In effect
Antimony & Thallium	1201 and 1221	Determination of total antimony, arsenic, cad- mium, chromium, lead, selenium, silver, and thallium by flameless atomic absorption	In effect
Aluminum, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Nickel, Silver, Tin, Vanadium, Zinc	MET111	Jerrell Ash 1160 total metals in water	In effect
Cyanide	MIN74919	Total cyanide (manual distillation, automated spectrophotometric deter- mination)	In effect
Acidity	N/A	Titration with NaOH	In effect
Alkalinity	MIN74011	Titration with H ₂ SO ₄	In effect
Chloride	MIN72413	Fenic thiocyanate complex, spectrophoto- metric determination	In effect
Fluoride	MIN74515	Specific ion electrode	In effect

Table 7-2 (continued)

ANALYTICAL METHODS FOR INORGANICS ANALYSIS FROM CRL

<u>Parameter</u>	<u>CRL Method Number</u>	<u>CRL Method Designation</u>	<u>Effective Date</u>
Sulfate	MIN74112	Barium chloride and MTB, spectrophotometric determination	In effect
Ammonia Nitrogen	MIN7294	Automated phenolate/ nitroprusside spectro- photometric determination	In effect
TKN	MIN7304	Indophenol blue/nitro- prusside complex, spectrophotometric determination	In effect
Nitrate and Nitrite	MIN7284	Cadmium reduction, automated spectro- photometric determi- nation	In effect
TOC	MIN7347	Catalytic combustion, IR detection	In effect
Total Phosphorous	MIN7315	Ammonium molybdate and potassium antimonyl tartrate, spectrophoto- metric determination	In effect

SECTION 8

ANALYTICAL PROCEDURES

All waste, surface water, sediment, soil and groundwater samples collected for chemical analysis will be tested for the complete RAS organics and RAS inorganics (metals and cyanide) packages through the CLP. For high hazard samples, the CLP will prepare extracts at HSLs, and these extracts will be tested for the RAS organics and inorganics packages by SAS. The methods for performing these analyses are specified in the IFBs, WA84-A266/A267 for organics and WA84-J091/J092 for inorganics. The testing will also conform to the guidelines in the "User's Guide to the U.S. EPA Contract Laboratory Program, Revised July 1984." The analytical results for metals in soil and sediment will be reported on a dry weight basis. Soil samples will be shipped assuming low level contamination.

All samples collected from private wells will be tested for organics and inorganics parameters by the CRL as indicated in Table 2-2. The analytical methods for performing these analyses are shown in Tables 7-1 and 7-2 respectively. The analytical methods for performing SAS of fluoride and total suspended solids are described in the individual SAS request forms which are attached in Appendix C.

As part of organics analysis by both CLP and CRL, computer assisted library searches will be made to tentatively identify as many as 30 organic compounds (10 volatiles and 20 extractables) in addition to those listed in Tables 4-2 and 4-6. However, no more than 4 hours per sample will be spent in the search for the identity of unknowns. The three most matched compounds will be reported via a computer mass spectral library search. Positive peak identification requires at least a five-major-peak match (including the base peak and molecular ion peak), and the relative intensities of these peaks should not vary by +20 percent compared to the suspected compound. Compounds still unidentified after 4 hours are labeled as UNKNOWN #XXX; where XXX is the scan number where the unknown appears. Purity should also be included.

Geotechnical testing of soil samples will use the methods specified by ASTM. Atterberg Limits will be determined using method ASTM D 4318-83. Hydrometer and sieve analyses will be performed using method ASTM D 422-63. These methods can be found in "ASTM 1984 Annual Book of Standards, Volume 4.08, Soil and Rock; Building Stones," pgs 750-765 and pgs 116-126 respectively.

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SECTION 9

DATA REDUCTION, VALIDATION AND REPORTING

Analytical data from the CLP, including data generated by SAS analysis of high hazard extracts, will be evaluated by the Sample Management Office and the Contract Program Management Section of the CRL. In addition to the summarized forms for precision and accuracy of the analyses (EPA Form 1320-6), the CRL is requested to provide the analytical results for blanks and duplicates and the recovery data for matrix and surrogate spikes to the Site Manager.

Data reduction, validation, and reporting for analytical services at CRL are illustrated in Figure 9-1. Analytical reports from the geotechnical laboratory will include all raw data, documentation of reduction methods, and related QA/QC data. The data will be assessed by verification of the reduction results and confirmation of compliance with QA/QC requirements. The geotechnical laboratory deliverables packages will be appended to the RI report.

Raw data from field measurements and sample collection activities that is used in project reports will be appropriately identified and appended to the RI report. Where data have been reduced or summarized, the method of reduction will be documented in the report.

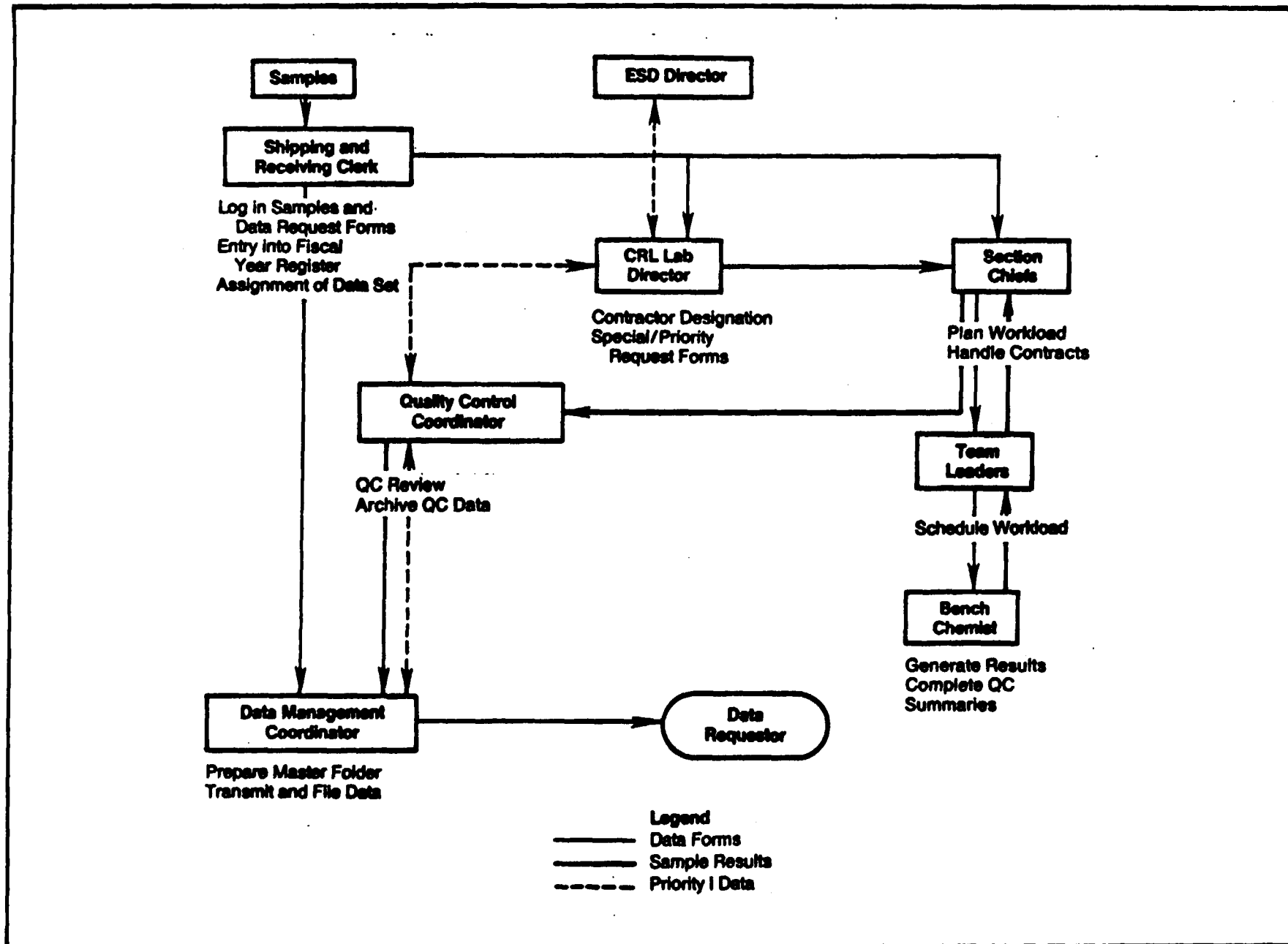


FIGURE 9-1 DATA FLOW AT CRL

SECTION 10

INTERNAL QUALITY CONTROL PROCEDURES

Internal quality control procedures for RAS from the CLP are specified in IFBs, WA84-A266/A267 for organics and WA84-J091/J092 for inorganics. The laboratories performing analyses of high hazard extracts for the RAS agencies and inorganics parameters will use the same internal QAC procedures. These specifications include the types of audits required (sample spikes, surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

Internal quality control procedures for analytical services from the CRL are summarized in Tables 4-1, 4-4 and 4-5 on the basis of the parameters being tested for. Table 4-1 lists the types and frequencies of QC audits; and Tables 4-4 and 4-5 present the QC acceptance limits for organics and inorganics respectively. Table 4-4 also includes the compounds to be used for surrogate and sample (matrix) spikes. The quality of data generated by the CRL is directly monitored at the bench level, and the QC data is reviewed at three administrative levels (Figure 9-1) before being issued to the user. Internal quality control requirements for the SAS of total suspended solids are described in the individual SAS request forms which are attached in Appendix C.

The quality control audits and acceptance criteria for data from the geotechnical laboratory are described in Subsections 4.2 and 4.3 of this document.

Quality control procedures for field measurements are limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and/or by calibrating the instruments (where appropriate). Quality control of field sampling will involve collecting field duplicates and blanks in accordance with the applicable procedures described in the Sampling and Analysis Plan (Appendix B) and the level of effort indicated in Table 2-2.

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SECTION 11

PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits of the CLP will be scheduled and executed by EMSL-Las Vegas. Performance audits, will be based on the laboratory's ability to properly analyze an unknown reference sample. Systems audits will be based on an on-site inspection of the laboratory. Audits of the CRL will be scheduled and executed by the Quality Assurance Office or QC Coordinator, CRL of Region V, U.S. EPA. Performance audits will be conducted on a quarterly basis, and systems audits will be conducted on an annual basis.

The Site Manager will monitor and audit the performance of QA/QC procedures to ensure that the project will be executed in accordance with this QAPP. Systems audits of the geotechnical laboratory will be scheduled by the Site Manager and executed by the individuals identified above in Subsection 3.3. One systems audit will be performed for each of these laboratories during the project. Performance audits of the field and geotechnical laboratories are not required.

The Site Manager will also schedule two systems audits of the sampling and monitoring-well installation activities to ensure that the Sampling and Analysis Plan is being adhered to and/or that variances are justified and documented. These audits will be scheduled to allow oversight of as many different field activities as possible, and will be performed by the individual identified above in Subsection 3.3. A written report on the results of these audits, along with a notice of nonconformance (as necessary), will be submitted to the appropriate individuals identified in Subsection 3.1 of this document.

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SECTION 12

PREVENTIVE MAINTENANCE

This section applies solely to field equipment. For this project, this includes a field pH meter, a YSI specific conductance and temperature meter, a Foxboro Century 128 OVA, and an HNu photoionization detector. Specific preventive maintenance procedures and spare parts lists for this equipment are referenced in the Sampling and Analysis Plan (Appendix B). The Field Manager will be responsible for implementing and documenting these procedures on a weekly basis during the period of use.

Preventive maintenance for the magnetometer will be performed by the trained technician that will accompany and use the equipment while on site.

SECTION 13

DATA ASSESSMENT PROCEDURES

Analytical data from the CLP, including data generated by SAS analysis of high hazard extracts, is assessed for accuracy, precision, and completeness by the Contract Program Management Section of the CRL with overview by the Sample Management Office of the CLP in accordance with respective standard procedures.

The assessment of data generated by the CRL is initiated at the bench level and continued at three administrative levels. The bench chemist directly responsible for the test knows the current operating acceptance limits. He can directly accept or reject the data he generates and consult with his Team Leader for any corrective action. Once the bench chemist has reported the data that he feels are acceptable, he initials the report sheet. Any out-of-control results that occur are flagged and a note is made as to why the result was reported.

The Team Leader receives the data sheets, reviews the quality control data that accompanied the sample run, initials the report sheet, and forwards it to the Section Chief. The Section Chief, after checking the reported data for completeness and quality control results, either initials the report sheet or sends it back to the Team Leader for rerunning of samples. The QC Coordinator reviews the data forwarded to him as acceptable by the Section Chief. Any remaining out-of-control results that, in the opinion of the QC Coordinator, do not necessitate rerunning of the sample are flagged and a memo written to the data user regarding the utility of the data. Data generated from all high priority studies are given a final review by the CRL Director.

Data from the SAS, and geotechnical laboratories and data from field measurements will be assessed by thorough review of QA/QC data (calibrations, standards, blanks, duplicates), documentation that analytical procedures were adhered to, and reports from systems audits.

All data will be reviewed for completeness by the principal investigators as appropriate to their operational responsibilities.

SECTION 14

CORRECTIVE ACTION PROCEDURES

If the quality control audit results in detection of unacceptable conditions or data, the Site Manager will be responsible for developing and initiating corrective action. The REM II Region V Manager will be notified if the nonconformance is of program significance or requires special expertise not normally available to the project team. Corrective action may include:

- o Reanalyzing the samples, if holding time criteria permit.
- o Resampling and analyzing.
- o Evaluating and amending sampling and analytical procedures.
- o Accepting the data and acknowledging its level of uncertainty.

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SECTION 15

QA REPORTS

No separate QA report is planned for this project. The revised RI report and the revised FS/Conceptual Design report will each contain separate QA/QC sections summarizing the quality of the data collected and/or used as appropriate to each phase of the project. The Site Manager, who has responsibility for these summaries, will rely on written reports/memoranda documenting the data assessment activities and the performance and systems audits.

APPENDIX A

ANALYTICAL DATA

TABLE A-1

U.S. EPA SAMPLING RESULTS
SURVEILLANCE AND ANALYSIS DIVISION
ENVIRONMENTAL EMERGENCY AND INVESTIGATIONS BRANCH
AT AMERICAN CHEMICAL SERVICE AND GRIFFITH CITY LANDFILL
MAY 8-9, 1980
(CONCENTRATION UNIT IN PPB)

	Subsurface Soil Sample #1 15' N of ACS Off-Site Containment Area	Subsurface Soil Sample #2 36' E of ACS Off-Site Containment Area	Water Sample #1 from Leachate Pool 10' N of ACS Off-Site Containment Area	Water Sample #2 from Run Off From Griffith Landfill
Phenol	K1,400	26	K13	350
Isophorone	K700	6.2	K240	K0.7
Naphthalene	12,000	21	29	K0.5
Fluorene	1,000	6.1	K23	K0.8
Diethylphthalate	K7,400	2,500	K240	10
Phenanthrene and anthracene	1,400	26	K42	K1.0
Di-n-butylphthalate	1,100	11	K240	21
Bis(2-ethylhexyl)phthalate	110,000	71	510	63
Butylbenzylphthalate	8,300	117	K240	K0.7
Bis(2-chloroethyle)ether	K400	K5.5	300	28
Dimethylphthalate	K510	K5.5	2,300	K0.7
Methylnaphthalenes(2)	32,000	-	-	-
Dimethylnaphthalenes(5)	22,000	-	-	-
Diphenylether	3,800	-	-	-
Polychlorinated Unknown	12,000	-	-	-
Hydrocarbons(2)	5,100	-	-	-
(2-Ethoxy)Ethyl Acetate	-	17,000	-	-
2-(Hydroxymethyl)-1-pentanol	-	40,000	-	-
Trimethyl-2-cyclohexen-1-one	-	36,000	-	-
N-methyl-2-pyrrolidone	-	11,000	-	-

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TABLE A-1 (continued)

	Subsurface Soil Sample #1 15' N of ACS Off-Site Containment Area	Subsurface Soil Sample #2 36' E of ACS Off-Site Containment Area	Water Sample #1 from Leachate Pool 10' N of ACS Off-Site Containment Area	Water Sample #2 from Run Off From Griffith Landfill
1-(2-butoxyethoxy)ethanol	-	6,800	-	-
2-ethylhexanoic acid	-	4,100	-	-
methylphenols (2)	-	57,000	-	-
Ethylphenols (3)	-	58,000	-	-
Dimethylphenols (2)	-	15,000	-	-
Pentylphenol	-	4,100	-	-
Methoxytrimethylphenol	-	11,000	-	-
Dimethyl Benzenedicarboxylate	-	5,300	-	-
2,2,4-Trimethyl-3-cyclohexen- 1-methanol	-	1,700	-	-
N-methyl-2-pyrrolidone	-	-	-	180
Methylphenol	-	-	-	120
Dimethylphenol	-	-	-	52
Pentylphenol	-	-	-	81
Trimethyl-cyclohexanone	-	-	-	160
2-(2-Methoxy-1-methylethoxy) -1-propanol	-	-	-	500
1-(2-Methoxy-1-methylethyl) 2-propanol	-	-	-	43
1,1'-oxybis-2-chloroethane	-	-	-	53
3,3-5-trimethylcyclohexene	-	-	-	460
Unknown	-	9,500	200	120

1-Data obtained from U.S. EPA analytical results: Data set EEIB 280 and 281 samples collected at American Chemical Service, Inc. and Griffith Landfill July 3, 1980.

2-Compounds 1-11 are priority pollutants confirmed by mass spectra and gas chromatographic retention time.

3-Compounds 12-39 are non-priority pollutants confirmed by computer library search and quantified according to standards.

4-K indicates lower detection limit.

5-Parenthesis () indicates the number of isomers present.

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TABLE A-2

U.S. EPA SAMPLING RESULTS
SURVEILLANCE AND ANALYSIS DIVISION
ENVIRONMENTAL EMERGENCY AND INVESTIGATIONS BRANCH
AT AMERICAN CHEMICAL SERVICE, INC. AND GRIFFITH LANDFILL
MAY 8-9, 1980
(CONCENTRATION UNIT IN PPM)

	Soil Sample #1 (mg/g)	Soil Sample #2 (mg/g)	Water Sample #1 mg/l
Ca	3.8	K0.5	381
Mg	2.8	0.9	74.6
Na	K0.1	K0.1	195
Ag	K0.3	K0.3	11
Al	3,700	3,400	467
B	K8	K8	1,800
Be	0.2	0.2	K1
Ba	11	13	335
Cd	K0.1	K0.2	184
Co	4	2	427
Cr	11	8	254
Cu	13	9	117
Fe	9,100	7,600	10,400
Mn	370	55	8,550
Mo	6	6	57
Ni	9	5	544
Pb	14	15	282
Sn	15	K10	K100
Ti	88	74	13
V	12	11	34
Y	5	7	19
Zn	26	20	2,300
Total Hg	.049 mg/kg	.036 mg/kg	.8 ug/l
Total CN	K0.3 mg/kg	K.03 mg/kg	96 ug/l

Data obtained from U.S. EPA analytical results. Data set EEIB samples collected at American Chemical Service, Inc. and Griffith Landfill June 12, 1980.

1. K indicates lower detection limit.
2. Sample number correspond to those given in Table A-1.

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TABLE A-3

ECOLOGY AND ENVIRONMENT, INC. WELL SAMPLING RESULTS
ECOLOGY AND ENVIRONMENT, INC. WELL SAMPLING DATA
AMERICAN CHEMICAL SERVICE, INC. AND GRIFFITH LANDFILL
GRIFFITH, INDIANA
NOVEMBER 3, 1982

	Monitoring Well #1 (ppm)	Monitoring Well #2 (ppm)	Monitoring Well #3 (ppm)	Monitoring Well #4
1,2-Trans-dichloroethylene	-	34	-	-
Ethylbenzene	1.6	10	-	-
Toluene	16	35	-	-
Vinyl chloride	-	680 ppb	-	-
2,4-Dimethylphenol	-	33	-	-
Pentachlorophenol	-	36	-	-
Bis-(2-chloroethyl) ether	-	327	-	-
Benzene	24	29	-	-
1,1,1-Trichloroethane	-	1.1	-	-
Chloroethane	-	980	96	-

Data obtained from E&E analytical results for sampling at ACS November 3, 1982.

1. Well #4 was dry. A sample was not collected.

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TABLE A-4

INDIANA STATE BOARD OF HEALTH
1981 LAKE COUNTY GROUNDWATER SURVEY RESULTS
(PPM)

Well	Location	Turbidity	pH	CaCO ₃ H	Mo	Fe	Mn	Ca	Mg	Na	K	Cl	SO ₄	PO ₄	Ba	Cd	Cr (TOT)	Pb	TDC	NO ₃	COD
Ramon Mathis Farm	1	7	7.3	229	123	1.8	.22	64	17	10	.8	15	93	.15	-	-	-	-	2.6	.2	CS
Pritchett	2	.1	7.7	164	76	<.05	.04	46	12	3	3.5	13	52	.09	-	-	-	-	2	4.2	CS
Crago	3	.7	7.3	204	140	.47	.29	54	17	4	1.2	6	60	<.09	-	-	-	-	6.4	1.2	18
Brown	4	2	7.5	126	72	1	.06	38	8	2	.2	8	53	.15	-	-	-	-	1.5	<.1	CS
Rosevear-Howe	5	5	7.2	344	188	1.1	.89	93	27	3	2.6	14	130	.09	-	-	-	-	4.3	2.7	10
Rosevear-Tennant	6	1	7.1	400	276	.2	.29	114	28	11	30	28	77	<.09	-	-	-	-	4.7	<19	10
Rosevear-Barn	7	.5	7.0	560	302	.15	.80	166	39	7	20	32	180	<.09	-	-	-	-	7.5	<25	17
Huber Sod Co.- Milrant	8	9	6.8	468	348	2.2	.96	118	42	30	38	59	150	<.09	-	-	-	-	10.7	.8	22
Huber Sod Co.-Home	9	25	6.8	466	344	5.5	1.0	124	38	30	42	59	150	<.09	-	-	-	-	10.9	.9	25
Jerry Hayden	10	20	7.1	516	376	2.4	.05	121	52	8	1.6	9	140	<.09	-	-	-	-	1.2	<.1	CS
Ron Sherman	11	1	7.1	586	386	.31	.18	128	65	26	2.1	44	200	<.09	-	-	-	-	1.2	.5	CS
Hanson Home	12	40	7.1	510	378	5.4	.06	106	61	12	1.9	<5	150	<.09	-	-	-	-	2.9	<.1	CS
Methery Home	13	2	7.7	8	372	.35	<.02	<2	<2	180	.2	<5	75	<.09	-	-	-	-	1.7	<.1	CS
Ray Creekaur	14	30	7.2	412	352	3.8	.04	83	50	14	1.7	7	86	<.09	-	-	-	-	2.9	<.1	CS

TABLE A-4 (continued)

INDIANA STATE BOARD OF HEALTH
1981 LAKE COUNTY GROUNDWATER SURVEY RESULTS
(PPM)

Well	Location	Turbidity	pH	CaCO ₃ H	Mo	Fe	Mn	Ca	Mg	Na	K	Cl	SO ₄	PO ₄	Ba	Cd	Cr (TOT)	Pb	TOC	NO ₃	COO
Jewell Rogers																					
712 E. Elm	15	0.6	7.8	200	200	.77	.03	50	18	7	.7	<5	18	<.09	.050	<.002	.010	<.010	2		<5
Salisbury Eng																					
1501 E. Main	16	10	7.6	322	344	1.4	.02	74	34	19	2.3	<5	34	.15	.260	<.002	<.010	<.010	2.2		<5
American Chemical	17	.5	7.6	312	396	.14	<.02	59	40	63	5.7	5	60	<.09	.080	<.002	<.010	<.010	1.0		<5
American Chemical	18	35	7.3	306	396	3.3	.03	58	39	65	6.8	<5	62	<.09	.110	<.002	.010	<.010	1.0		<5
Silvester Reder	19	30	7.3	398	312	3.7	.09	94	40	16	1.8	21	100	<.09	.150	<.002	.010	.020	1.5		<5
Kim Evans	20	20	7.3	474	388	2.6	.02	96	57	22	2.9	<5	130	<.09	.170	<.002	.010	<.010	1.0		<5
1902 Edison Ave.	21	25	7.3	790	456	3.3	.05	146	104	45	3.9	51	350	<.09	.070	<.002	.030	.010	1.2		<5
Howard Long	22	25	7.3	628	464	3.2	.03	122	79	26	3.1	<5	210	<.09	.070	<.002	.010	.010	1.5		<5
Glen Slaney																					
553 N. Raymond	23	5	7.6	224	252	.92	<.02	50	24	14	1.7	<5	5	<.09	.200	<.002	<.010	<.010	1.4		<5
Gose Home																					
1106 S. Broad	24	30	7.3	668	460	4.8	.03	123	87	37	3.9	<5	280	<.09	.050	<.002	.010	<.010	2.2		<5
Frank Rozick	25	8	7.6	240	168	1.1	.02	53	26	7	1.4	7	77	<.09	.040	<.002	.010	<.010	1.3		<5
John Price	26	6	7.7	236	120	.84	.08	54	24	12	.9	17	120	.15	.090	<.002	.010	<.010	1.9		<5
Douglas Waldron	27	8	7.7	204	224	1.1	<.02	51	18	12	1.2	<5	<5	.2	.130	<.002	.010	<.010	2.2		<5
Citizen's TV	28	5	7.8	228	316	1.0	<.02	49	26	37	2.5	<5	<5	.2	.190	<.002	.010	<.010	<1.0		<5
Lovin Home	29	2	7.8	156	168	.64	.02	38	15	6	.9	-	5	.15	.090	<.002	.010	<.010	<1.0	<5	
Ernest Van Byssum																					
1818 E. Elm	30	10	7.6	228	244	2.9	.04	62	18	11	1.0	<5	<5	.2	.080	<.002	.020	<.010	3.1		<5
Hayworth Home	31	10	7.4	300	328	2.1	.02	75	27	13	1.4	<5	12	.05	.150	<.002	.010	<.010	4.0		<5
Arthur Hegedus																					
1009 S. Wood	32	20	7.4	500	392	3.5	.03	96	63	26	3.5	<5	200	<.09	.140	<.002	.010	<.010	2.4		24

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TABLE A-5

PRIVATE WELLS SAMPLED BY LAKE COUNTY HEALTH DEPARTMENT
LAKE COUNTY, INDIANA
FALL 1984

<u>Location</u>	<u>Results</u>
Paul Good 1029 Reder Road	No Contamination Detected
Oak Ridge Park Colfax Avenue	No Contamination Detected
Mike Milsap 1002 Reder Road	No Contamination Detected
Michael Lovich 420 East Avenue H	No Contamination Detected
Mark Jansen 938 S.Arbogast	No Contamination Detected
Burge 5013 Calhoun	No Contamination Detected
O'Neil 1007 Reder Road	6.2 ppb Benzene and 0.9 ppm Acetone

APPENDIX B

SAMPLING AND ANALYSIS PLAN

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V

EPA CONTRACT NO: 68-01-6939
WORK ASSIGNMENT NO: 61-5LJ7.0

SAMPLING AND ANALYSIS PLAN FOR
AMERICAN CHEMICAL SERVICE, INC.
GRIFFITH, INDIANA

DOCUMENT NO: 160-WP1-QA-AWRL-1

JUNE 1985

PREPARED BY
ROY F. WESTON, INC.
BANNOCKBURN, ILLINOIS

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AMERICAN CHEMICAL SERVICE, INC., GRIFFITH, INDIANA

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- B SAS Request Forms

SECTION 1

INTRODUCTION

1.1 OBJECTIVES OF SAMPLING PROGRAM

The objectives of the sampling program to be implemented as part of the RI/FS at the American Chemical Services site in Griffith, Indiana, are as follows:

- o To determine and characterize the location, nature, and volume of the contaminated areas on-site including the Still Bottoms Pond, Treatment Pond 1, Kapica Dump Site, the On-Site Drum Containment Area, and the Off Site Drum Containment Area. Also included in the sampling program is monitoring well installation at the suspected waste disposal area in the Griffith Landfill.
- o To determine the details of on-site soil stratigraphy and the stratigraphy of adjacent off-site areas.
- o To determine the hydrogeologic conditions in the upper aquifer and the water supply aquifer including vertical and horizontal groundwater flow conditions on-site and in adjacent off site areas.
- o To determine the configuration of the water table in the upper aquifer and the potentiometric surface in the water supply aquifer on-site and in adjacent downgradient areas off-site.
- o To identify surficial drainage features and flow patterns, and characterize the relationship of surface water to groundwater on-site and in adjacent off-site areas.
- o To characterize the extent and migration of groundwater contamination in the upper aquifer and in the water supply aquifer on-site and in adjacent off-site areas.
- o To characterize the extent of surface water and sediment contamination on-site and in adjacent off-site areas.
- o To determine if groundwater currently being pumped by private wells within one mile of the site is contaminated with priority pollutants.

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American Chemical Services, Inc.
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1.2 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities in this plan includes the installation of 40 groundwater monitoring wells, drilling of 14 soil and waste borings, trenching of 6 waste pits, and collection and analysis of 325 samples. Chemical analysis to detect priority pollutants and other hazardous materials will be performed on 259 samples, of which 213 are investigative, 23 are duplicates, and 23 are blanks. Geotechnical index properties (grain-size distribution, Atterberg limits, hydraulic conductivity) will be determined for 66 samples, including 6 field duplicates, to characterize on-site soil materials. The environmental media to be sampled include groundwater, surface water, sediment, soil and private water wells. Waste will also be collected and sampled. A summary of sampling effort is summarized in Table 1-1, and the sampling and analysis program is presented in detail in Table 1-2.

TABLE 1-1

SUMMARY OF SAMPLING EFFORT

	<u>Investigative</u>	<u>Duplicate</u>	<u>Blank</u>
Waste Pit (WP)	18	2	2
Natural Soil-Pit (NP)	6	1	1
Waste Boring (WB)	34	3	3
Natural Soil-Boring (NB)	8	1	1
Soil Area (SA)	16	2	2
Soil Boring (SB)	18	2	2
Groundwater (GW) I filtered	40	4	4
I unfiltered	7	1	1
II filtered	20	2	2
II unfiltered	3	1	1
Surface Water (SW) unfiltered	9	1	1
Sediment (SD)	9	1	1
Private Wells (PW)	25	2	2
Subtotals			
Solid	109	12	12
Liquid	104	11	11
Subtotal	213	23	23
Chemical Subtotal	259		
Geotechnical*	60	6	-
Geotechnical Subtotal	66		
Grand Total	325		

*Samples for geotechnical testing will be collected during monitoring well installation.

TABLE 1-2

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American Chemical S
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SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Waste Pits (High)	Qualitative organic vapor screening with OVA and HNu	RAS high hazard sample preparation by HSL for following by SAS:	18	1	18	2	1	2	2	1	2
		RAS organics parameters including 30 tentatively identified parameters	18	1	18	2	1	2	2	1	2
		RAS inorganics parameters/metals	18	1	18	2	1	2	2	1	2
		RAS inorganics parameters/cyanide	18	1	18	2	1	2	2	1	2
Natural Soils- Waste Pits (Medium)	Qualitative organic vapor screening with OVA and HNu	RAS organics package from CLP including 30 tentatively identified parameters	6	1	6	1	1	1	1	1	1
		RAS inorganics package/metals from CLP	6	1	6	1	1	1	1	1	1
		RAS inorganics package/cyanide from CLP	6	1	6	1	1	1	1	1	1
Waste Borings (High)	Qualitative organic vapor screening with OVA and HNu	RAS high hazard sample preparation by HSL for following by SAS:	34	1	34	3	1	3	3	1	3
		RAS organics parameters including 30 tentatively identified parameters	34	1	34	3	1	3	3	1	3
		RAS inorganics parameters/metals	34	1	34	3	1	3	3	1	3
		RAS inorganics parameters/cyanide	34	1	34	3	1	3	3	1	3

Note: Field parameters determined for investigative and duplicate samples only.

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Natural Soils- Waste Borings (Medium)	Qualitative organic vapor screening with OVA and HNu	RAS organics package from CLP including 30 tentatively identified parameters	8	1	8	1	1	1	1	1	1
		RAS inorganics package/metals from CLP	8	1	8	1	1	1	1	1	1
		RAS inorganics package/cyanide from CLP	8	1	8	1	1	1	1	1	1
Soil Areas (Low)	Qualitative organic vapor screening with OVA and HNu	RAS organics package from CLP including 30 tentatively identified parameters	16	1	16	2	1	2	2	1	2
		RAS inorganics package/metals from CLP	16	1	16	2	1	2	2	1	2
		RAS inorganics package/cyanide from CLP	16	1	16	2	1	2	2	1	2
Soil Borings (Low)	Qualitative organic vapor screening with OVA and HNu	RAS organics package from CLP including 30 tentatively identified parameters	18	1	18	2	1	2	2	1	2
		RAS inorganics package/metals from CLP	18	1	18	2	1	2	2	1	2
		RAS inorganics package/cyanide from CLP	18	1	18	2	1	2	2	1	2

Note: Field parameters determined for investigative and duplicate samples only.

TABLE 1-2 (continued)

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Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Groundwater (Low)	pH	RAS organics package from CLP including 30 tentatively identified parameters	40	1.5	60	6	1.5	9	6	1.5	9
	Specific conductance	RAS inorganics package/metals from CLP filtered samples	40	1.5	60	6	1.5	9	6	1.5	9
	Temperature	RAS inorganics package/metals and SAS for suspended solids-unfiltered samples	7	1.5	10	1	1.5	2	1	1.5	2
		RAS inorganics package/cyanide from CLP filtered samples	40	1.5	60	6	1.5	9	6	1.5	9
Surface Water (Low)	pH	RAS organics package from CLP including 30 tentatively identified parameters	9	1	9	1	1	1	1	1	1
	Specific conductance	RAS inorganics package/metals from CLP unfiltered samples	9	1	9	1	1	1	1	1	1
	Temperature	RAS inorganics package/metals from CLP unfiltered samples	9	1	9	1	1	1	1	1	1
Sediment (Low)	Not applicable	RAS organics package from CLP including 30 tentatively identified parameters	9	1	9	1	1	1	1	1	1
		RAS inorganics package/metals from CLP	9	1	9	1	1	1	1	1	1
		RAS inorganics package/cyanide from CLP	9	1	9	1	1	1	1	1	1

Note: Field parameters determined for investigative and duplicate samples only.

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Samples			Duplicate			QA Samples		
			No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Private Wells (Low)	pH	Acid extractables and base/neutral extractables from CRL	25	1	25	2	1	2	2	1	2
	Specific conductance	Pesticides and PCBs from CRL	25	1	25	2	1	2	2	1	2
	Temperature	Volatile organics from CRL	25	1	25	2	1	2	2	1	2
		Metals from CRL - unfiltered samples	25	1	25	2	1	2	2	1	2
		Cyanide from CRL - unfiltered samples	25	1	25	2	1	2	2	1	2
		Minerals from CRL (acidity, alkalinity, chloride, fluoride, sulfate)	25	1	25	2	1	2	2	1	2
		Nutrients from CRL (ammonia, TKN, nitrate-nitrite, TOC, phosphorous)	25	1	25	2	1	2	2	1	2
Soil-Wells (Low)	Qualitative organic vapor screening with OVA and HNu	Atterberg Limits (ASTM D 4318-83)	18	1	18	2	1	2	-	-	-
		Particle Size Analysis (ASTM D 422-63) sieve analysis	18	1	18	2	1	2	-	-	-
		Particle Size Analysis (ASTM D 422-63) sieve analysis and hydrometer analysis	18	1	18	2	1	2	-	-	-
		Hydraulic conductivity	6	1	6	-	-	-	-	-	-

Note: Field parameters determined for investigativ and duplicate samples only.

ASTM methods can be found in American Society of Testing and Materials 1984 Annual Book of Standards, Volume 4.08, Soil and Rock; Building Stones, pgs. 750-765 and pgs. 116-126 respectively. Laboratory testing to be performed by a qualified geotechnical laboratory.

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SECTION 2

SAMPLE LOCATIONS AND RATIONALE

There is insufficient data regarding the volume, concentration, and character of waste disposed at the American Chemical Service (ACS) site. ACS has provided some information on the approximate location and general nature of waste disposal on-site, but additional data are needed. Therefore, an investigation of the major disposal sites (the Still Bottoms Pond and Treatment Pond 1, the On-Site Drum Containment Area, the Off-Site Drum Containment Area, and the Kapica Dump Site) needs to be completed. This will involve sampling of the waste and the natural soil materials underlying the waste. There is also evidence that waste material has been spilled or dumped on the ground in the Drum Storage Area and possibly within the old Kapica Drum (now Pazney Drum) property. Investigation of these areas will involve sampling of surficial soils for characterization of residual contamination. In addition a monitoring well will be installed at the suspected waste disposal location at the Griffith Landfill.

The most significant migration pathway at the ACS site is groundwater -- particularly in the upper aquifer, which begins at the ground surface. In 1982, four test wells were installed by FIT. A groundwater sample collected from one of these wells was found to contain substantial amounts of organic chemicals, including benzene, toluene, and trichloroethylene. Monitoring wells, sampled soil borings, water level measurements, permeability tests, and geotechnical testing of soil samples will be used to characterize this migration pathway. It is also possible that contaminants are migrating from the site via surface water, either by direct runoff or as a result of groundwater discharge to surface water bodies. Contamination accumulation in sediments could be occurring as well. These environmental media will be sampled and tested for hazardous chemicals. Private water supply wells within one mile of the site will be sampled as a precaution for protection of the public health and to provide information regarding the presence and extent of contamination in the lower aquifer, which is the main aquifer used for water supply in the area.

2.1 WASTE AND NATURAL SOIL SAMPLES FROM TEST-PITS

Three source areas are known to contain considerable numbers of buried drums -- the On-Site Drum Containment Area, the Still Bottoms Pond, and Treatment Pond 1. In two of these areas, the drums were used as "engineered fill" and are very densely packed. Test-pits will be used to profile the wastes in these areas and to allow collection of waste and natural soil samples from below the waste. One test-pit will be sufficient in the On-Site Drum Containment Area, two test-pits are needed in the Still Bottoms Pond (parts of which now have process

structures built on top), and three test-pits will be needed in Treatment Pond 1. In each of the six test pits, three waste samples and one natural soil sample will be collected. This sampling will provide data for evaluating the volume, concentration, and character of the wastes in these source areas and for assessing the extent to which the wastes are moving into adjacent soil materials. The approximate locations of the test pits are shown in Figure 2-1.

2.2 WASTE AND NATURAL SOIL SAMPLES FROM BORINGS

Test borings will be used to collect waste and natural soil samples in two of the source areas -- the Off-Site Drum Containment Area, and the Kapica Dump Site. Although there is evidence of a substantial number of drums buried with Off-Site Drum Containment Area, test borings will be used rather than test pits because (1) there is a clay cap over the area and (2) it seems likely that the drums are not densely packed. Thus, there should be less damage to the integrity of the clay cap with a good probability of sampling success. Five borings will be drilled in the Off-Site Drum Containment Area with five waste samples and one natural soil sample collected from each boring. Three borings are planned for Kapica Dump Site, which apparently consists of alternating layers of sludges from drums and soil. Three waste samples and one natural soil sample will be collected from each of these borings. This sampling will provide data for evaluating the volume, concentration and character of the wastes in these source areas and for assessing the extent to which the wastes are moving into adjacent soil materials. The approximate locations of the test borings are shown in Figure 2-1.

2.3 SOIL AREA SAMPLES

In both the ACS Drum Storage Area and the former Kapica Drum property, there is evidence which indicates that minor drips, spills and leaks of various chemical substances did or could have occurred over a period of several years. Resulting residual contamination of the unsaturated zone, if there is any remaining at this time, would be dispersed throughout relatively large areas. Composite soil samples will be used to provide a general characterization of any residual contamination in these potential source areas. The Drum Storage Area will be divided into four sampling areas and the former Kapica Drum property will be divided into two sampling areas. Within each sampling area, soil will be collected at five discrete sites at two depth intervals -- 6 to 12 inches and 18 to 24 inches. Composite samples will be formed on the basis of sampling area and depth of the sample. In addition to these twelve composite samples, grab samples will be collected at two specific areas -- near the former fume incinerator and at the site of a spill/fire incident -- at the same two depth intervals (6 to 12 inches and 18 to 24 inches). The approximate locations of the sampling areas for the soil area samples are shown in Figure 2-2.

Scale in Feet

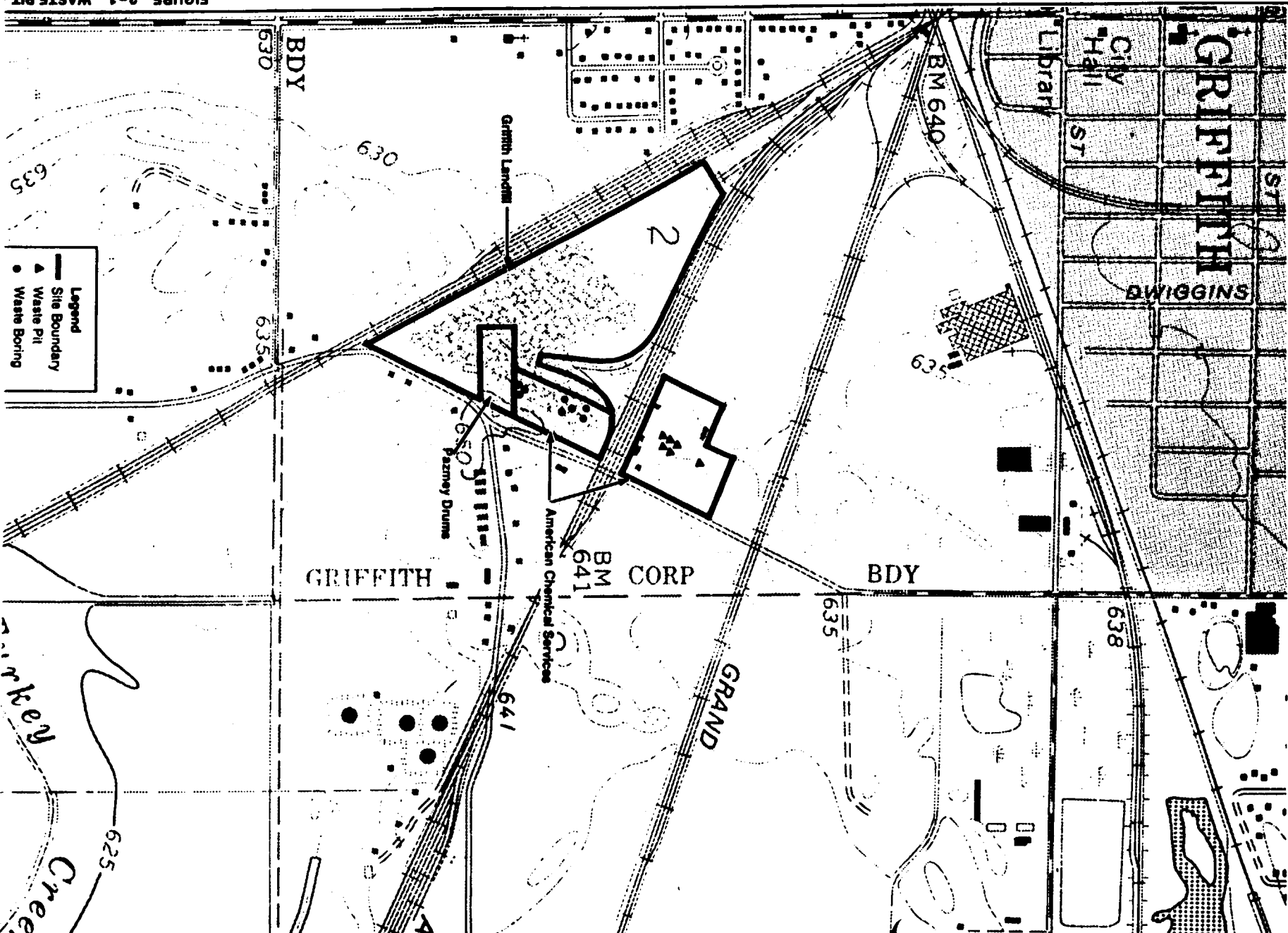
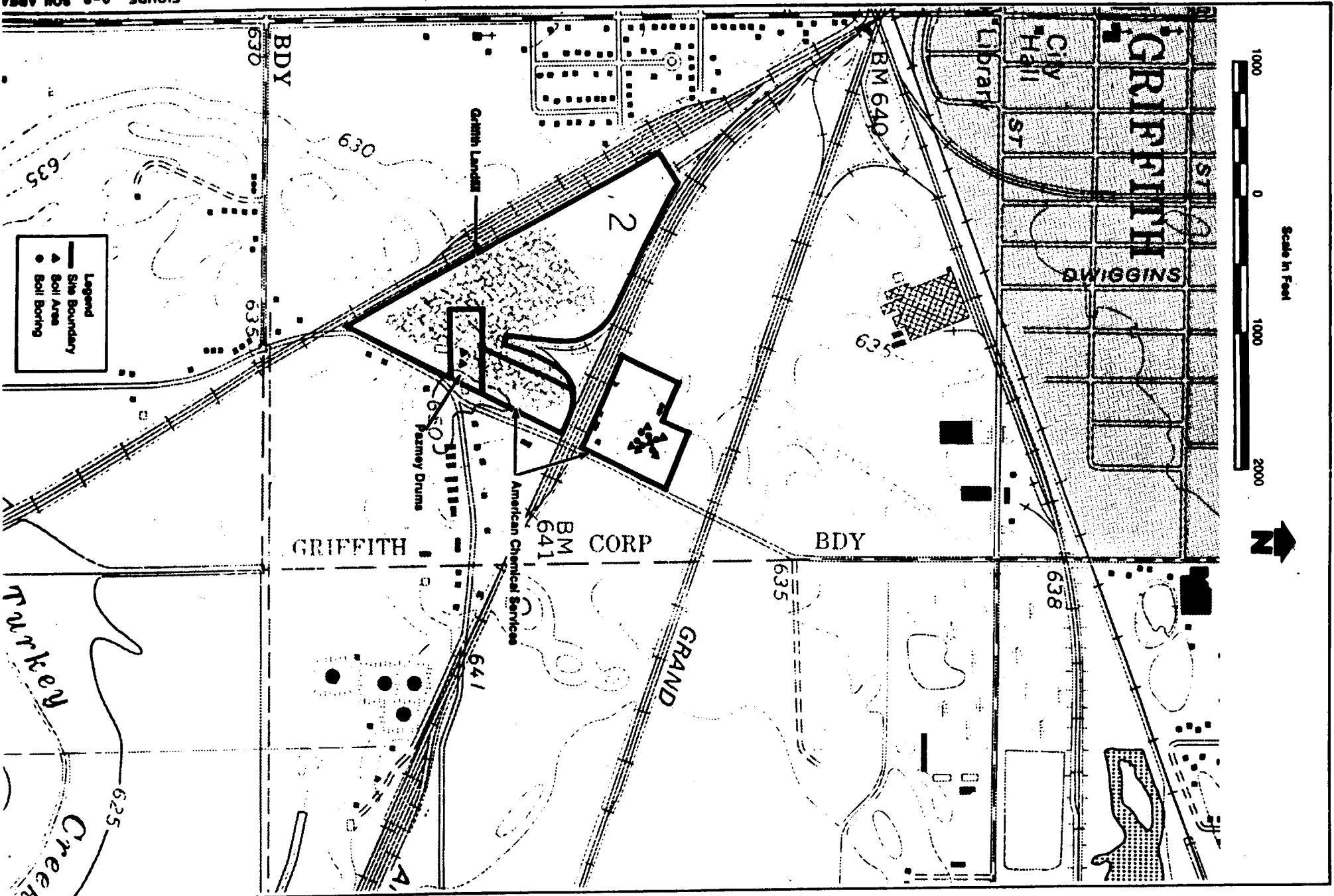


FIGURE 2-1 WASTE PIT, BORING LO

FIGURE 2-2 SOIL AREA
BORING L



2.4 SOIL BORING SAMPLES

Specific data regarding the vertical distribution of residual soil contamination in the Drum Storage Area is needed to complement the general data regarding areal extent obtained from the soil area samples. This data will be collected using six continuously sampled soil borings. The actual borings will be located on the basis of qualitative organic vapor screening performed during soil area sampling so that attenuation profiles can be developed for a range of near-surface contaminant conditions. In each soil boring, samples from the depths of 1-1.5 feet, 2-2.5 feet and 4-4.5 feet will be submitted to the laboratory for chemical analysis. The approximate locations of the soil boring samples are shown in Figure 2-2.

2.5 MONITORING WELLS AND GROUNDWATER SAMPLES

Regional groundwater flow in the vicinity of the ACS site is reportedly to the northeast. However, due to several features near the site, flow patterns on-site are not well defined. A small creek is located 1/2 mile to the south and the only other major surface water body is the Little Calumet River, located three miles to the north. Therefore, there may be a local drainage divide through or to the north of the site. Griffith Landfill has also excavated thirty feet of soil material and is pumping to control the inflowing water, which may also affect local groundwater flow.

Based on existing subsurface data, the hydrostratigraphy at the site appears to consist of:

- o A surficial fine- to coarse-grained sand with fine to coarse gravel, and small amounts of peat and silt, about 20-feet thick
- o An intervening silty clay to clay unit containing discontinuous lenses of gravel, 15 to 30-feet thick
- o A deeper sand and gravel unit, 90-feet thick.

A fourth soil unit consisting of thick, stiff clay is reported in the area, but borings indicate it is absent on-site. The deeper sand and gravel unit is the major water supply aquifer in the area. The depth to bedrock, which consists of interbedded shales and dolomites, is about 130 feet.

Installation of groundwater monitoring wells will provide the data needed to determine the vertical and horizontal directions of groundwater flow and the horizontal and vertical extent of contamination. Also, they will provide better stratigraphic and geotechnical information of the sediments under the site. Because groundwater is the major contamination concern, 40 monitoring wells will be installed:

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- o Six well nests consisting of three wells each; evenly spaced around the entire site, each having a well screened at the water table, another screened at the base of the upper aquifer, and a third screened in the lower water supply aquifer.
- o Four well nests consisting of two wells each; one well screened at the water table, the other screened at the base of the upper sand unit, evenly spaced around the perimeter of the entire site. One nest will utilize a pre-existing well screened at the water table, and only a well screened at the base of the upper aquifer will be installed.
- o Eight single-well installations, screened at the water table, located in major waste disposal or storage areas.
- o Six single-well installations, screened the entire length of the upper sand, located approximately 1000 feet away from the site, spaced evenly around it.

The three-well nests will provide vertical groundwater flow data within the upper aquifer and between the upper and lower aquifer, as well as potentiometric surface data. These, and the two-well nests will also give detailed information on the presence, if any, of lighter-than-water and heavier-than-water organic contaminants and their distribution vertically within the upper aquifer. Single wells screened throughout the entire length of the upper aquifer will also provide data of vertical distribution of organics and will aid in defining the extent of contamination. Single wells screened at the water table, along with all other wells in the upper aquifer, will provide the configuration of the water table and direction of groundwater flow. Selected soil samples collected during installation of the monitoring wells will be tested for geotechnical index properties to characterize the subsurface soils. Six undisturbed samples of the silty clay unit will be tested for hydraulic conductivity.

One round of groundwater samples will be collected from all wells and based on the analytical results, a maximum of one-half of the wells will be resampled. Filtered aliquots for metals analysis will be collected at all sampling locations. Unfiltered aliquots will be taken from about sixteen percent of the wells and determination of total suspended solids will be performed on these samples using SAS. The approximate locations of the wells are included in Figure 2-3.

2.6 SURFACE WATER AND SEDIMENT SAMPLES

Surface water draining from the site may contain hazardous contaminants. In addition, contaminated groundwater could be discharging to nearby surface water bodies -- the marsh west of the

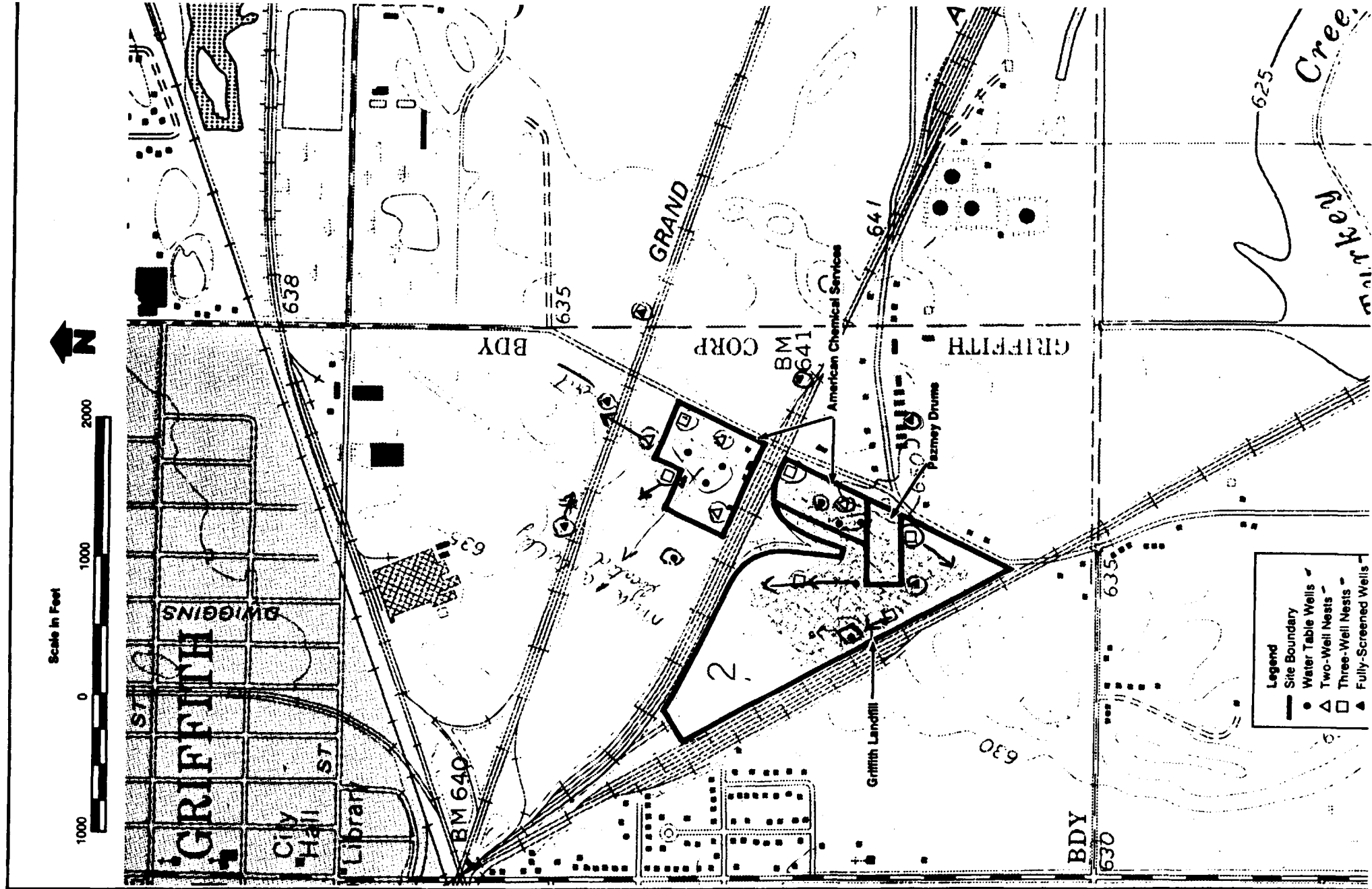


FIGURE 2-3 MONITORING WELL

Red - One Well
Blue - even water

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ACS property and the sumped excavation in the Griffith Landfill. Contaminants could also be accumulating on or migrating with related sediments. Samples of surface water and sediment will be collected and analyzed to assess these possibilities. Sampling locations include Treatment Pond 2, the ACS Retention Pond, a drainage ditch at the southwest corner of the ACS plant, the marsh, ponded water near the Off-Site Drum Containment Area, the Griffith Landfill excavation, and three sites along a drainage ditch connecting the marsh to Turkey Creek. The approximate locations of these nine pairs of surface water and sediment samples are shown in Figure 2-4.

2.7 PRIVATE WATER WELLS

Surveys will be performed to identify sources of drinking water and groundwater utilization within one mile of the site. By using data collected during these surveys and information concerning local groundwater flow patterns obtained from the newly installed monitoring wells, 25 private wells within one mile of the site will be selected for sampling and chemical analysis. To the extent possible, these wells will be representative of upgradient and downgradient positions, have an even geographic distribution, and include users of the upper and lower aquifers. Existing data, suggests that the main areas of groundwater use for drinking water are located to the south and east of the ACS site.

2.8 DOCUMENTING SAMPLE LOCATIONS

The physical locations of all monitoring wells, borings and on-site (or immediately adjacent off-site) sampling sites will be documented photographically and determined by taping and leveling surveys. Taping surveys will use existing buildings, light poles and similar fixed objects shown on the existing site map as reference points. At least three reference points will be used to locate each sampling site. The leveling survey will be tied to mean sea level datum, which may require an off-site traverse to establish an on-site benchmark. Surface water, sediment and soil area sampling locations will be established and surveyed in advance of sample collection. Soil boring, soil trench and monitoring well sites will be surveyed during or after the work is performed. Stakes will be used at sampling locations lacking other physical reference points. Horizontal accuracy will be to within 1.0 foot and vertical accuracy will be to within 0.10 foot.

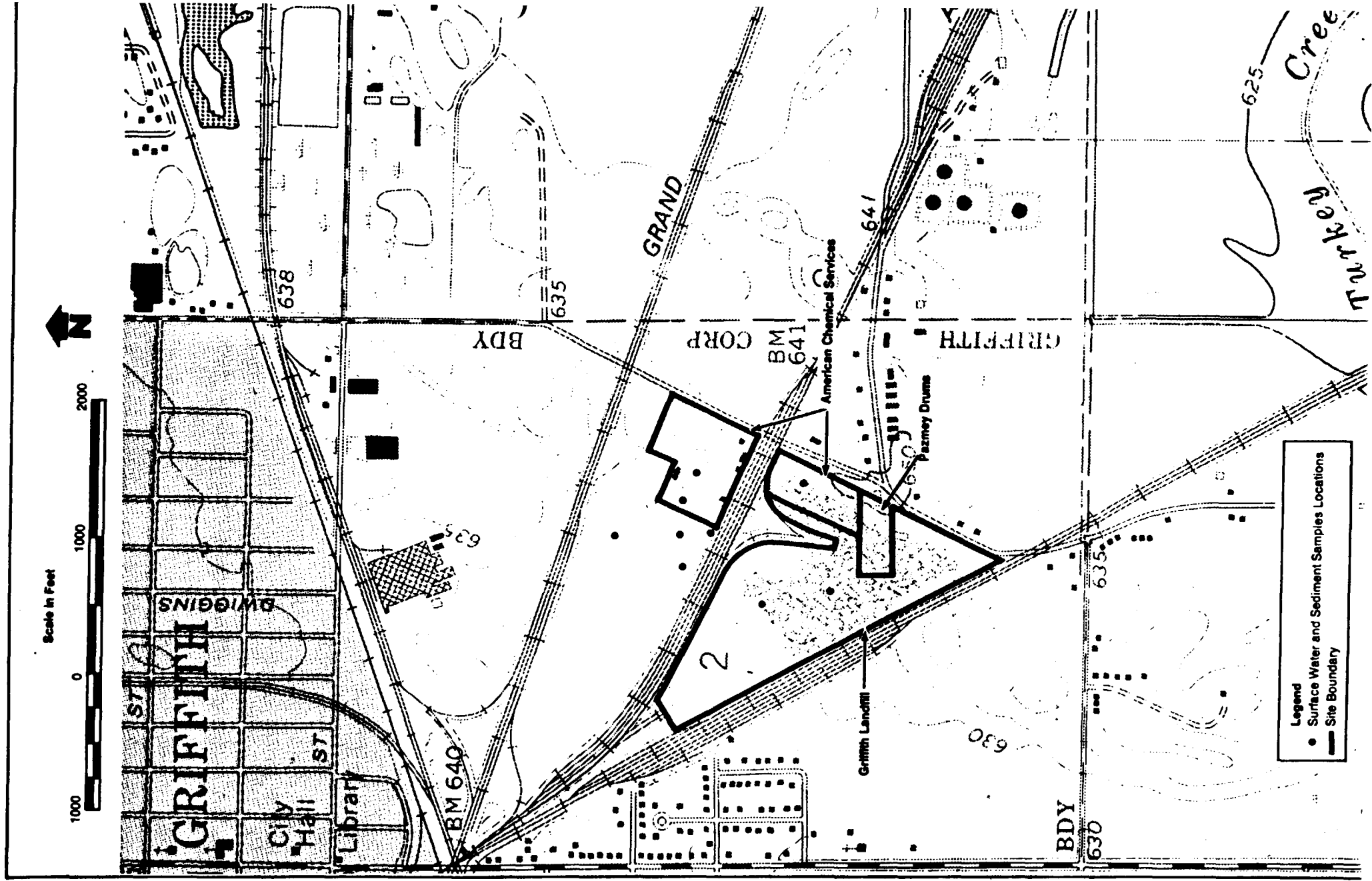


FIGURE 2-4 SURFACE WATER AND SAMPLING LOCATION

SECTION 3

SAMPLE NUMBERING SYSTEM

All samples for chemical analysis, including duplicates and blanks, will be given a unique sample number. A listing of sample numbers, cross-referenced to chain-of-custody and shipment documents, will be maintained in the sample handling logbook.

3.1 GENERAL SAMPLE NUMBERING SYSTEM

Two identification numbers will be used for each sample. One will be the serial identification number on the tag attached to the sample shipped to the laboratories; the other will be used for in-house identification of the sample. Under the CLP, the laboratories use the traffic report number to report the results of the analysis. EPA sample tag numbers and/or SAS traffic forms will be used for all samples. The in-house number will be used to incorporate field data into an alphanumeric code. The in-house system is discussed later in this section.

The serial identification number is described as follows:

- 85 - designates fiscal year
(October 1 through September 30)
- H - indicates samples sent by CH2M Hill
- A - designates project manager
(as assigned, A through A)
- 01 - designates survey number
(as assigned, 01 through 99 for each project manager A through Z)
- S - indicates sample type
(S = sample, D = duplicate, R = blank)
- 01 - designates sample number within a give survey
(as assigned, 01 through 99 for each survey 01 through 99)

Upon requesting codes from the documentation coordinator, each project manager will be assigned an alphabetic character A through Z which will be used in all his/her sample codes regardless of the specific site. Survey and sample numbers are site-specific and are allocated in blocks for each sampling trip. Individual sample codes are to be assigned to specific samples by the project manager or sample team leader. A record should be kept of these numbers along with other tracking information for each sample.

3.2 IN-HOUSE SAMPLE NUMBERING SYSTEM

An in-house sample numbering system will be used to identify each sample taken during the sampling program. This numbering system will provide a tracking procedure to allow retrieval of information about a particular sample and will assure that each sample is uniquely numbered. A listing of the sample identification numbers will be maintained by the Sampling Team Leader. Each in-house sample number will be composed of three components, which are described below.

Project Identification

A two-letter designation will be used to identify the site where the sample is collected. For this project, it will be AC, which stands for American Chemical.

Sample Type

Each sample type collected during the sampling program will be identified by a two-digit alpha code. A list of two-letter codes for sample types is presented in Table 3-1.

Sample Location

A three-digit numbering system will be used to indicate the sampling location. The identification system will require that all sampling locations be given a separate number. The field ties to these sampling locations as well as all other pertinent data will be kept in the field sampling notebook by the Sampling Team Leader. Location numbers for each sample type are presented in Table 3-1.

Sample Number

Sample number--a two-digit number indicating the first, second, third, etc., sample collected at a given location; or a two-letter code indicating a duplicate (DP) or blank (BK).

In-House Sample Numbering System Example

An example of a sample number is:

- o AC-GW024-02

American Chemical site -- groundwater sample from location 024, second sample.

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Some examples of the In-House sampling number system are as follows:

- o AC-WP-004-01: American Chemical Service, waste pit sample, location 004, first sample.
- o AC-SA-022-DP: American Chemical Service, soil area sample, location 022, duplicate.
- o AC-GW-055-BK: American Chemical Service, groundwater sample, location 055, blank (taken prior to collecting investigative sample at this location).

Duplicates and blanks must be taken at different locations during each sampling round.

All other pertinent data relating to the sampling event will be included in the sampling notebook.

TABLE 3-1

SAMPLE TYPE CODE AND LOCATION NUMBERS

Type	Code	Location
Waste and Natural Soil-Pit	WP, NP	001-006
Waste and Natural Soil-Boring	WB, NB	007-014
Soil Areas	SA	015-022
Soil Borings	SB	023-028
Groundwater	GW	029-068
Surface Water and Sediment	SW, SD	069-077
Private Wells	PW	078-102

Note: Soil samples collected during installation of the monitoring wells, which may be tested for geotechnical properties, will have a two-letter code of SL and the appropriate three-digit location number.

SECTION 4

SAMPLE LOCATIONS

4.1 WASTE AND NATURAL SOIL SAMPLES FROM TEST PITS

Six test pits will be excavated in three areas of known waste burial (the Still Bottoms Pond, Treatment Pond 1, and the On-Site Drum Containment Area) to characterize the nature and concentration waste present and to estimate the volume contained in each area.

Excavation of the test pits will be done with a backhoe and will proceed by layers. That is, the pit will be deepened until different materials are encountered; then the pit will be enlarged areally by careful scraping of the remaining material in that layer. This will allow "clean" surficial materials to be segregated from "dirty" wastes and drums and to be stockpiled. It will also allow the test pit to be backfilled to essentially original conditions.

Because these areas are known to contain buried drums, extreme care will be taken during excavation of the test pit. A magnetometer survey will be conducted prior to the excavation in order to determine the extent of the drum burial areas. In addition to using an experienced backhoe operator, ambient and in-trench air conditions will be monitored for organic vapors, hydrogen sulfide, hydrogen cyanide and explosive gases during excavation. Evidence of excavations (disturbed soil structures) or waste burial (discolored soil, non-soil solids, etc.) will be noted, and the entire side wall areas of the pits will be photographed.

Where evidence of waste burial is found, up to three waste samples will be collected in each pit. A 4-inch diameter bucket auger, angled into the sidewall from the opposite side of the pit, will be used to obtain the samples. The material retrieved by the auger will be emptied onto a sheet of Teflon for closer examination and then placed in sample containers using stainless steel spatulas. All sampling equipment will be decontaminated in accordance with the standard protocol presented in Table 4-1 prior to each use. If possible, the pit will be excavated through the waste and just into the underlying natural soils. When natural soils are encountered, the 4-inch bucket auger will be used to obtain a sample of this material from a depth of at least one foot below the bottom of the waste.

The sampling team for this sampling task (4.1) will consist of three people using level C protection with a contingency to upgraded level B if necessary. Downgrading to level D will be kept as an option if environmental monitoring indicates it is safe. Authorization must come from SSO.

TABLE 4-1

STANDARD DECONTAMINATION PROTOCOL FOR SAMPLING EQUIPMENT

- STEP 1 -- Scrub equipment thoroughly with soft-bristle brushes in a low-sudsing detergent solution.
- STEP 2 -- Rinse equipment with tap water by submerging and/or spraying.
- STEP 3 -- Rinse equipment with acetone by spraying until dripping; retain drippings.
- STEP 4 -- Rinse equipment with distilled water by spraying until dripping.
- STEP 5 -- Rinse equipment with ultra-pure water by spraying until dripping.
- STEP 6 -- Place equipment on plastic or aluminum foil and allow to air-dry for five to ten minutes.
- STEP 7 -- Wrap equipment in plastic or aluminum foil for handling and/or storage until next use.
- Notes: In addition to the standard protocol, pumps and discharge lines will be decontaminated by pumping the detergent solution, tap-water rinse through the equipment.

4.2 WASTE AND NATURAL SOIL SAMPLES FROM BORINGS

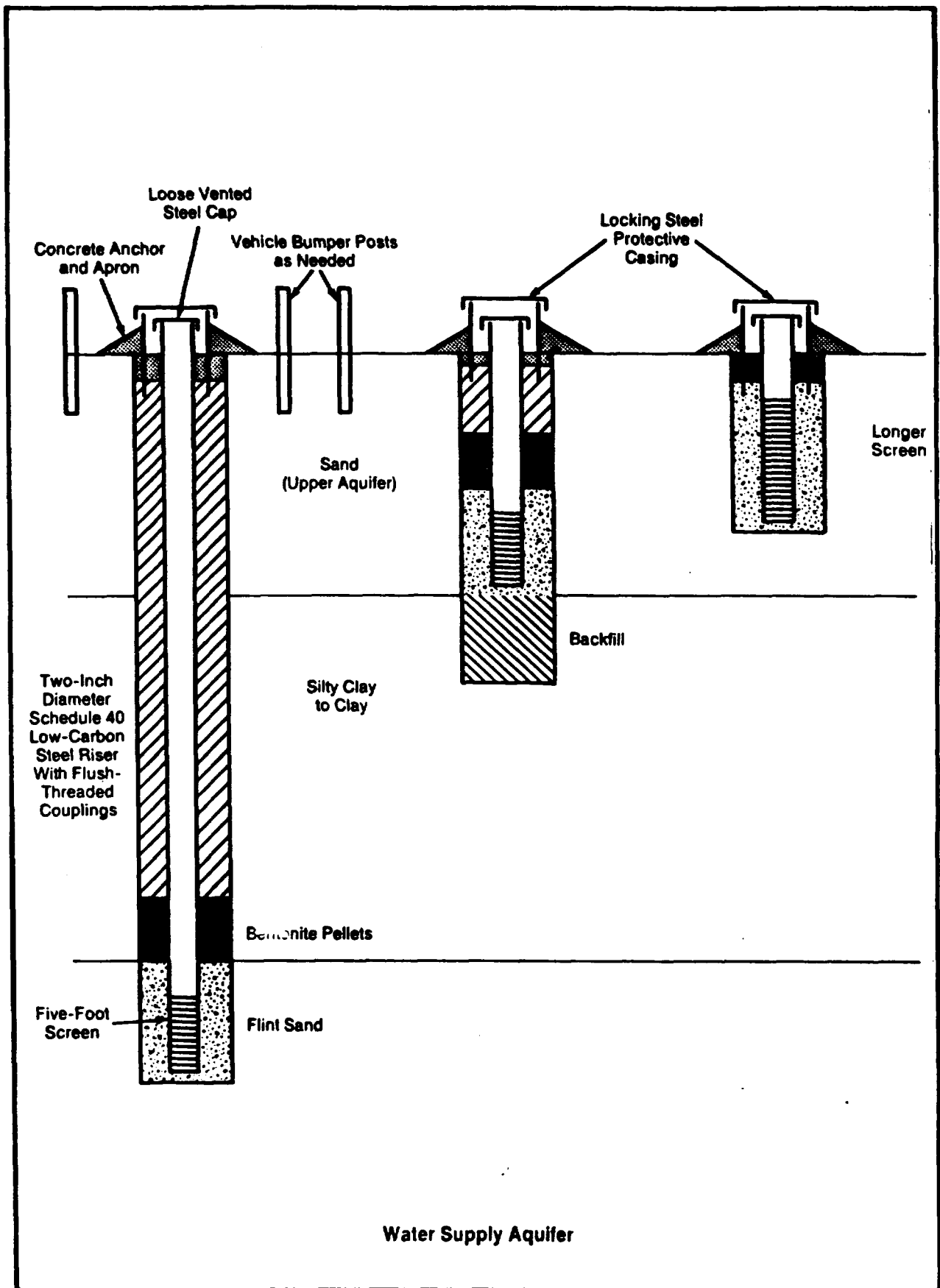
Test borings will be performed at eight on-site locations in two potential source areas (the Off-Site Drum Containment Area and the Kapica Dump Site) to characterize the nature and volume of wastes present. A magnetometer survey will be conducted prior to drilling in order to identify the extent of the drum burial in the off-site drum containment area. Each boring will be sampled continuously from the ground surface until natural soil is encountered. Samples will be collected using a 3-inch diameter split-spoon device that will be driven into the ground in consecutive 18-inch intervals. The over-sized split-spoon is needed to provide enough sample for standard CLP analyses, especially when duplicates are collected.

The boring will be advanced using hollow stem augers or other methods approved by the geologist that do not use drilling fluids. Because drums are known to be buried in one of these areas, the boring locations will be selected using geophysical survey results and the borings will be advanced with extreme care. The levels of volatile organics, hydrogen cyanide, and explosive gases in the borehole will be measured after every sample is collected.

Upon recovery from the borehole, the sampler will be placed on a clean Teflon sheet and opened. As the spoon is opened, the soil/waste material will be qualitatively screened with OVA and HNu instruments and described by a qualified geologist or geotechnical engineer. The instrument readings and soil/waste description will be entered in the sampling logbook. The soil/waste material will then be divided into three six-inch samples and placed in separate sample containers using stainless steel spatulas. If less than 18 inches of soil is recovered by the split-spoon, the geologist or geotechnical engineer will use his judgment to assign depth intervals to the recovered material.

Five six-inch samples will be sent to the laboratory from each boring in the Off-Site Drum Containment Area and three six-inch samples will be sent from borings at the Kapica Dump Site. The samples to be analyzed are those having depths of 0, 1, 2, 4 and 8 feet at the top of the sample increment as appropriate. The split spoons, Teflon sheet and spatulas will be decontaminated in accordance with the standard protocol presented in Table 4-1 prior to each use. The drilling rig and all related equipment and tools used at one boring will be steam-cleaned prior to re-use.

The sampling team for this task (4.2) will consist of three people and will be in level C with a contingency of level B. Downgrading to level D will be kept as an option if environmental monitoring indicates that is is safe. Authorization for downgrading must come from the SSO.



**FIGURE 4-1 CONSTRUCTION DETAILS
THREE-WELL NEST**

- o A four-inch diameter, locking protective casing will be installed at the surface with a concrete anchor and runoff diversion apron. The steel riser will be covered with a loosely fitting, vented steel cap. Locks will be provided. Three vehicle-bumper posts will be installed around the well if it is located in a traffic area.
- o The well will be developed by surging and pumping until five well volumes have been removed and clear water is obtained during pumping. Upon completion of development, a bail down recovery test as described in subsection 4.11 will be performed to document the sensitivity of the well and provide data for calculating the hydraulic conductivity of the screened interval.

The shallow wells at these locations (two-well nests) will be installed using similar procedures except that:

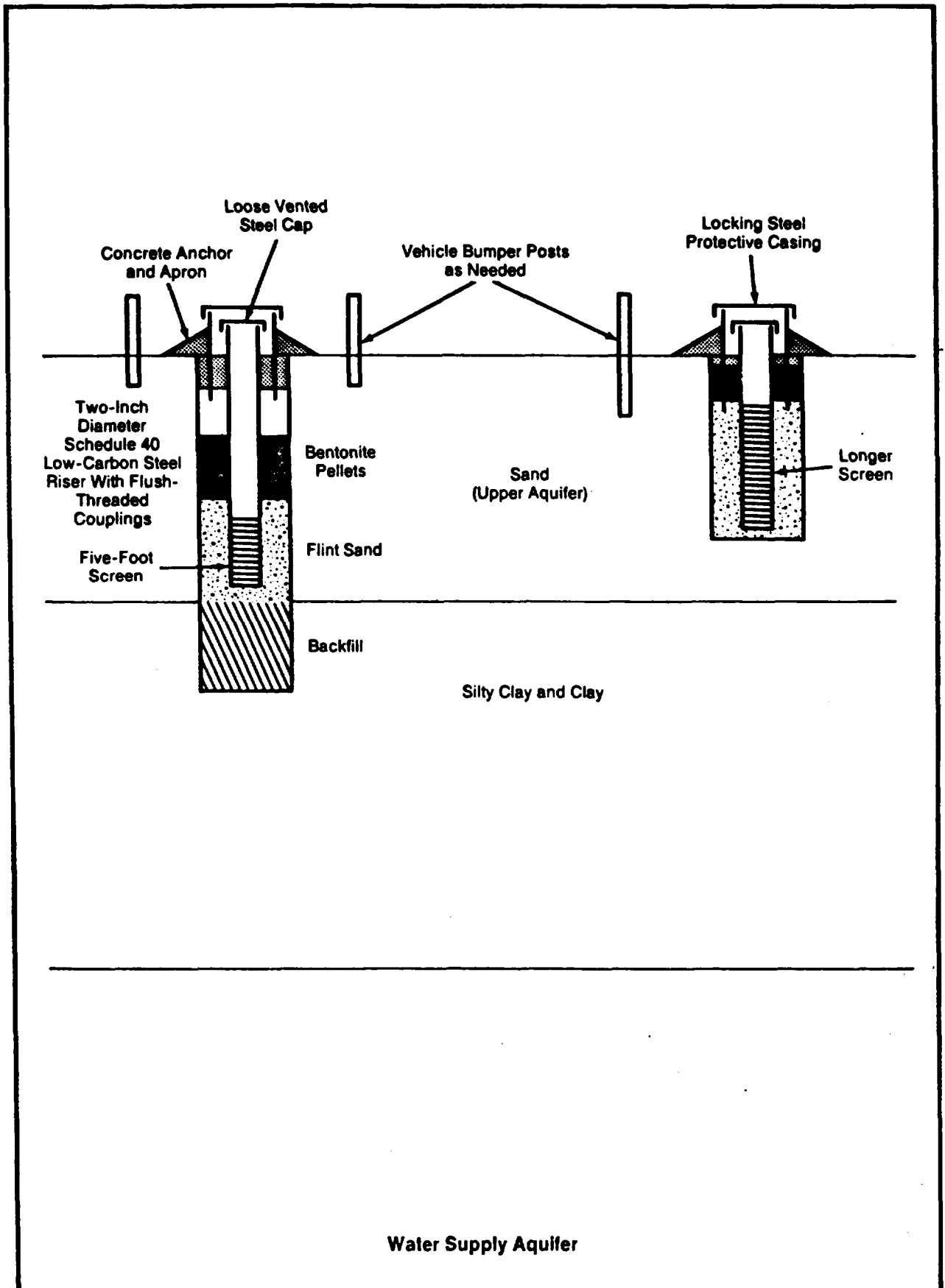
- o Samples will be collected at 5-foot intervals to the bottom of the boring.
- o The depth of the boring will be determined in the field and will be screened at the water table.
- o The screened interval will extend from the bottom of the boring to within three feet of the surface.
- o Extra care will be taken to ensure that the annular of the well is completely sealed against surface runoff.

The details of well construction for two-well nests are shown in Figure 4-2.

4.5.3. Single-Well Installations - Water Table Wells

Monitoring wells at locations having only one well screened at the water table will be installed last using the following procedures:

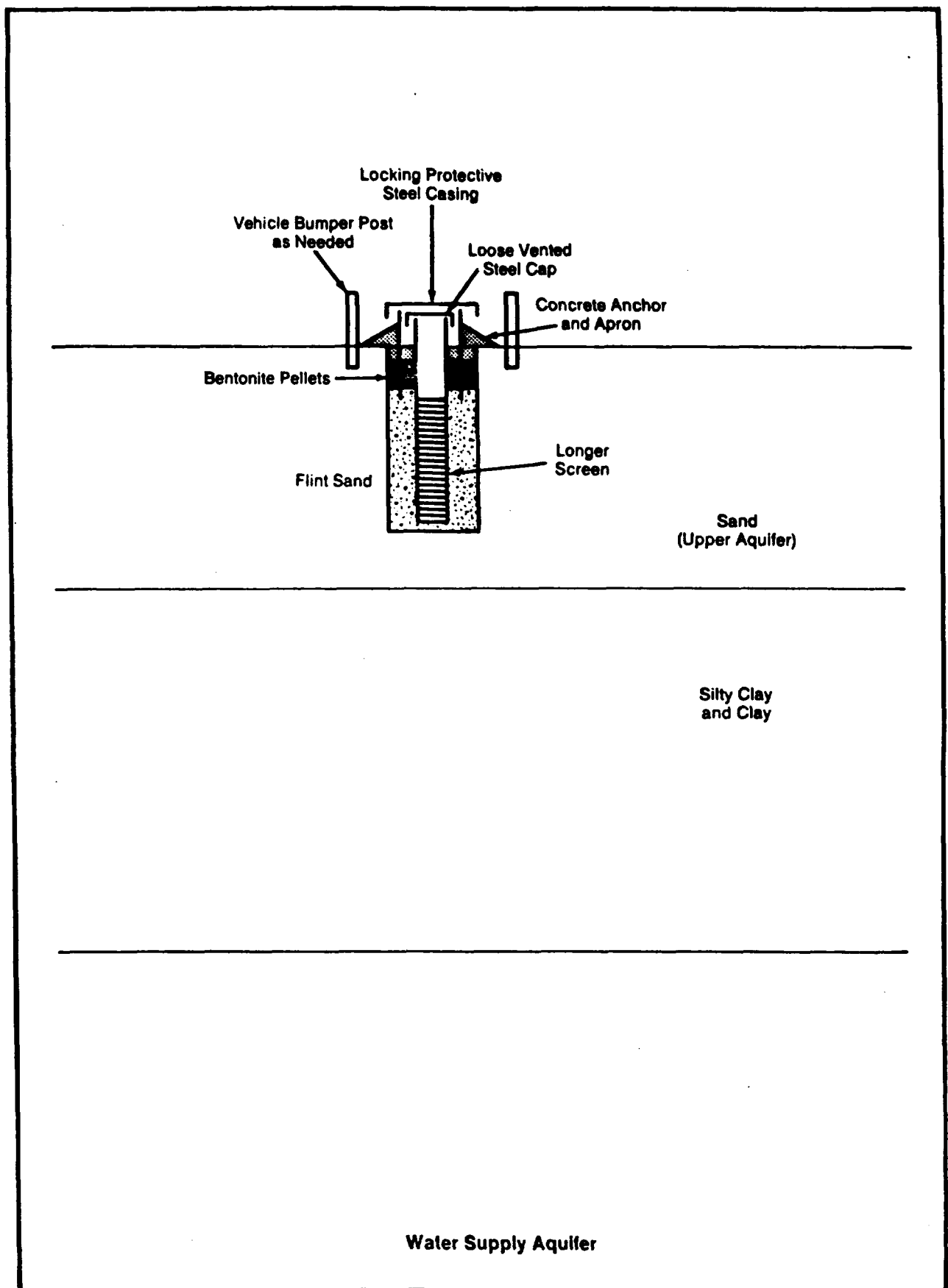
- o The working end of the drilling rig and all equipment, tools and materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from coming into contact with surficial soils during drilling and well installation.
- o The borehole will be advanced using wash-rotary drilling methods with 4-inch casing (or 6-inch hollow stem augers) advanced continuously ahead of the open hole and clean water as the recirculated drilling fluid.



**FIGURE 4-2 CONSTRUCTION DETAILS
TWO-WELL NEST**

- o Samples will be collected using standard split-spoon and Shelby tube samplers. Samples will be collected at 2.5-foot intervals to the bottom of the boring. As each sample is recovered, it will be qualitatively screened for organic vapors using OVA and HNu instruments. The instrument readings and soil description will be entered into a sampling logbook. The boring will be logged by a geologist or geotechnical engineer and the samples retained for future reference and possible geotechnical index testing.
- o Drilling and sampling will proceed until the boring is approximately seven feet below the water table. Upon completion of drilling, the borehole will be flushed with clean water to remove all suspended solids from the inside of the casing.
- o The well will be constructed out of 2-inch diameter, low carbon steel with flush-threaded couplings and a five-foot screened interval at the bottom. The screen will be factory mill-slotted or continuously slotted with openings of 0.010 inches.
- o The annular space around the screen will be backfilled with a silt-free flint sand to a height at least two feet above the top of the screen. A two-foot seal of compressed bentonite pellets will be placed above the sand pack.
- o A four-inch diameter, locking protective casing will be installed at the surface with a concrete anchor and runoff diversion apron. The low carbon steel riser will be covered with a loosely fitting, vented steel cap. Locks will be provided. Three vehicle-bumper posts will be installed around the well if it is in a traffic area.
- o The well will be developed by surging and pumping until five well volumes have been removed and clear water is obtained during pumping. Upon completion of development, a bail-down recovery test as described in subsection 4.11 will be performed to document the sensitivity of the well and provide data for calculating the hydraulic conductivity of the screened interval.

The details of well construction for the single-well, water-table installations are shown in Figure 4-3.



**FIGURE 4-3 CONSTRUCTION DETAILS
WATER TABLE WELL**

4.5.4 Single-Well Installations - Fully Screened Through Upper Aquifer

Monitoring wells at locations having only one well screened through the entire upper aquifer will be installed last using the following procedures:

- o The working end of the drilling rig and all equipment, tools and materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from coming into contact with surficial soils during drilling and well installation.
- o The borehole will be advanced using wash rotary drilling methods with 4-inch casing (or 6-inch hollow stem augers) advanced continuously ahead of the open hole and clean water as the recirculated drilling fluid.
- o Samples will be collected using standard split-spoon and Shelby tube samplers. Samples will be collected at 2.5-foot intervals to the bottom of the boring. As each sample is recovered, it will be qualitatively screened for organic vapors using OVA and HNu instruments. The instrument readings and soil descriptions will be entered into the sampling logbook. The boring will be logged by a geologist or geotechnical engineer and the samples retained for future reference and possible geotechnical index testing.
- o Drilling and sampling will proceed until the base of the upper aquifer is encountered. Upon completion of drilling, the borehole will be flushed with clean water to remove all suspended solids from the inside of the casing.
- o The well will be constructed out of 2-inch diameter, Schedule carbon steel with flush-threaded couplings and a fifteen-foot screened interval at the bottom. The screen will be factory mill-slotted or continuously slotted with openings of 0.010 inches.
- o The annular space around the screen will be backfilled with a silt-free flint sand to a height at least two feet above the top of the screen. A two-foot seal of compressed bentonite pellets will be placed above the sand pack.
- o A four-inch diameter, locking protective casing will be installed at the surface with a concrete anchor and runoff diversion apron. The low carbon steel riser will be covered with a loosely fitting, vented steel cap. Locks will be provided. Three vehicle-bumper posts will be installed around the well if it is in a traffic area.

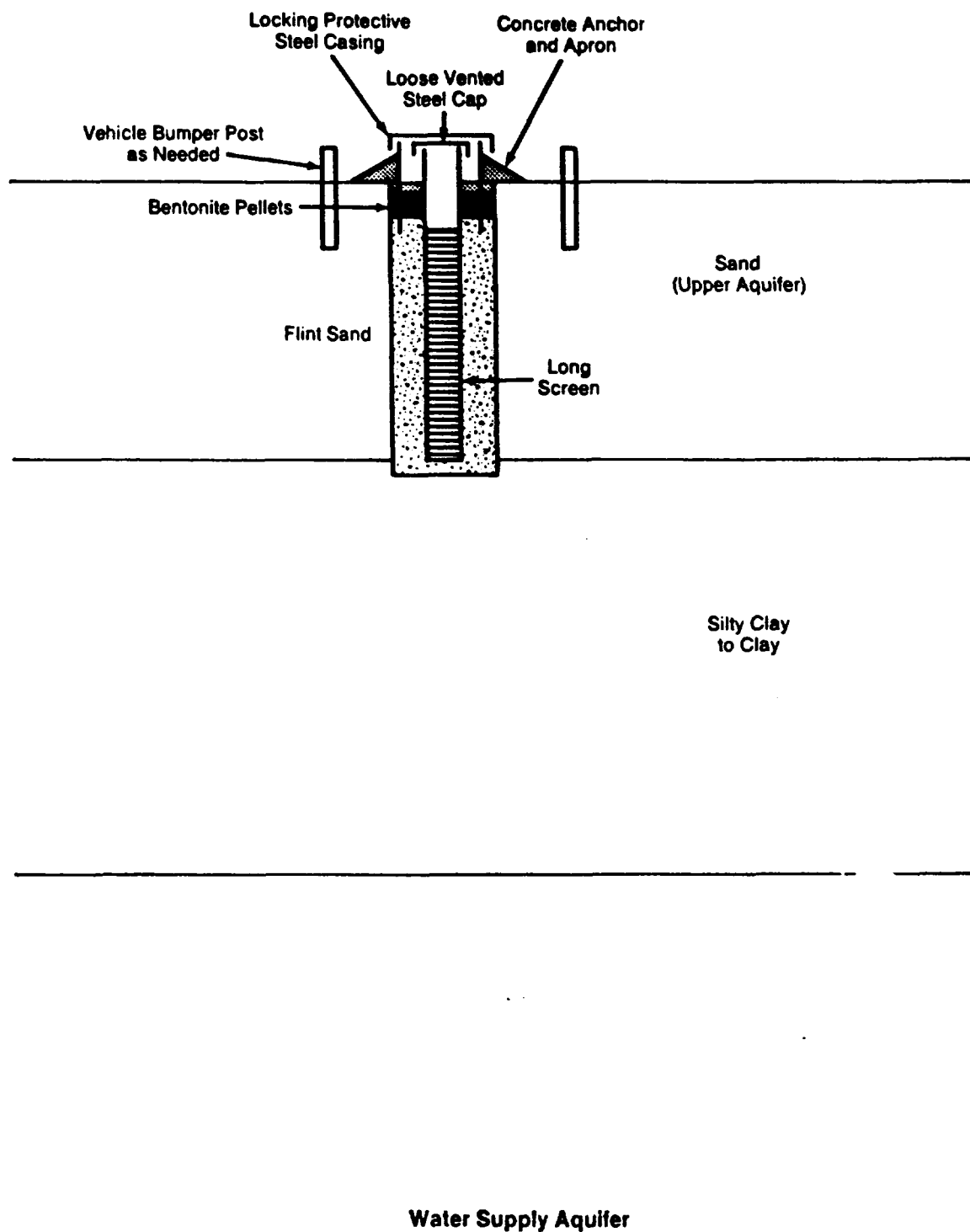
- o The well will be developed by surging and pumping until five well volumes have been removed and clear water is obtained during pumping. Upon completion of development, a bail-down recovery test will be performed to document the sensitivity of the well and provide data for calculating the hydraulic conductivity of the screened interval.

The details of well construction for the single-well, fully penetrating installations are shown in Figure 4-4.

4.6 GROUNDWATER SAMPLES

Groundwater samples will be collected from all 40 monitoring wells installed for this investigation. Samples will be collected using the following procedures:

- o The depth to the water level in the well will be measured with a weighted steel or fiberglass tape. The weight will be designed to create a popping sound on contact with the water surface. The depth to water and the time of measurement will be recorded.
- o Based on the water level measurement and the depth of the well, the volume of standing water in the well will be calculated.
- o The well will be purged using a positive displacement pump constructed of chemically inert materials which has been decontaminated in accordance with the standard protocol listed in Table 4-1. The standard procedure will be to pump until at least three well volumes have been removed.
- o Beginning with the fourth volume, periodic measurements of pH, specific conductance and temperature will be made using the procedures contained in Appendix A.
- o Purging may cease when measurements for all three parameters have stabilized (± 0.25 pH units, ± 50 $\mu\text{mhos/cm}$, and $\pm 0.5^\circ\text{C}$) for three consecutive readings or after five well volumes have been removed.
- o If the well pumps dry before three volumes have been removed, the well will be allowed to recharge for 15 minutes and then pumped dry again.
- o The sample will be obtained with a stainless steel or teflon bailer which has been decontaminated in accordance with the standard protocol listed in Table 4-1. The bailer will be raised and lowered in the well using a new length of nylon cord at each location.



**FIGURE 4-4 CONSTRUCTION DETAILS
FULLY-SCREENED SINGLE WELL**

Unfiltered samples for metals will be collected at all locations. Filtered samples for metals will be collected at about sixteen percent of the locations selected at random during sampling.

The sampling team for this task (4.6) will consist of three people and will be in level C with a contingency of level B. Downgrading to level D will be kept on as an option if environmental monitoring indicates that it is safe. Authorization to downgrade must come from the SSO.

4.7 SURFACE WATER SAMPLES

Surface water samples will be collected from nine locations including both on-site and off-site. Four of these nine locations have "flowing water" conditions while the other five have "standing water" conditions. Respectively these locations are as follows:

- o Three locations in a north-south drainage ditch along the west side of the marsh and one location at the southwest corner of the ACS plant area.
- o The Treatment Pond 2, the Retention Pond 2, the sumped excavation at Griffith Landfill, a small pond near the Off-site Drum Containment area, and the marsh.

Samples collected in "flowing water" situations will be collected at mid-stream, (i.e., the fastest flowing portion of the water) just below the water surface. Flow rates will be evaluated by measuring non-sectional area with a staff gage and tape, and by averaging five measurements of flow velocity determined using a wooden puck. Samples collected in "standing water" situations will be collected at a convenient location as far from the bank of the water body as possible. In both situations single-use intermediate collection bottles, obtained from a Bottle Repository, will be used to acquire the sample aliquots. For field measurements of pH, specific conductance and temperature will be measured and recorded using the procedures contained in Appendix A.

The sampling team for this task (4.7) will consist of three people and will be in level C with a contingency of level B. Downgrading to level D will be kept on as an option if environmental monitoring indicates that it is safe. Authorization to downgrade must come from the SSO.

4.8 SEDIMENT SAMPLES

Sediment samples will be collected at nine locations, which will coincide with location of the nine surface water sampling. Sediment samples will be collected using a 4-inch diameter bucket auger, and will consist of the top 6-inches of solid material at the sampling location. The material collected in the auger will be emptied onto a

sheet of Teflon and then transferred into the sample containers using stainless steel spatulas. The sampling equipment, including the spatulas and the Teflon sheet, will be decontaminated in accordance with the standard decontamination protocol presented in Table 4-1 prior to each use.

The sampling team for this task (4.8) will consist of three people and will be in level C with a contingency of level B. Downgrading to level D will be kept on as an option if environmental monitoring indicates that it is safe. Authorization to downgrade must come from the SSO.

4.9 PRIVATE WATER WELL SAMPLES

Private water well samples will be collected from twenty-five homes in the site vicinity. Access to all of these wells will be coordinated by the U.S. EPA, the ISBH, and Lake County Public Health officials. Samples will be collected as close to the well-head as possible, with sample bottles filled directly from a tap/spigot. The well pumps should be operating for at least 10 minutes prior to collection of the sample. Field measurement of pH, specific conductance and temperature will be performed using the procedures contained in Appendix A. The sampling team for this task will consist of two people in level D.

4.10 QUALITATIVE ORGANIC VAPOR SCREENING OF SOIL SAMPLES

The purpose of this activity is to obtain a preliminary indication of the magnitude and distribution of volatile contaminants in the subsurface. (The samples that will be sent in for laboratory analysis have been predetermined by depth so that an attenuation profile can be obtained.) Screening data may also be used to adjust the depths of monitoring wells, particularly in the upper two hydrostratigraphic units. The procedures are as follows:

- o Verify that the OVA and HNu have been calibrated within the past 4 hours and that the equipment is functioning properly. (For calibration operating and maintenance information refer to "Instruction & Service Manual, MI 2R900AC, Century Systems, Portable Organic Vapor Analyzer, Model OVA-128" and "Instruction Manual for Model PI 101, Photoionization Analyzer, HNu Systems, 1975.)
- o As the split-spoon is opened, pass the air intakes along the sample at a distance of about one-half inch, noting the location and magnitude of any readings.
- o At roughly six-inch intervals, position the intakes close to the sample and then disturb the soil material with a spatula, noting any readings.

- o If methane is believed to be interfering with OVA readings, attempt a second reading using a carbon filter. If hydrogen sulfide is believed to be interfering with HNu readings, attempt to verify its presence with an indicator tube.
- o Record the highest reading on each instrument for each six-inch interval of sample recovered, identifying interferences and basis of measurement.
- o Before the borehole is advanced or the next sample is taken, place the air intakes in the borehole, six inches below the ground surface, noting any readings and interferences as above.

4.11 BAILDOWN TESTING OF WELLS

The basic concept behind these tests is that the rate of rise of the water level in a well after an "instantaneous" withdrawal of a "slug" of water is a function of aquifer hydraulic conductivity. Thus by measuring water levels at various times following withdrawal of the slug, the hydraulic conductivity can be calculated. The basic requirements are being able to quickly withdraw a fairly large slug of water and being able to readily and accurately measure water levels in the well. Analysis of test data should use appropriate computational methods such as that presented by Bouwer, H. and R.C. Rice, 1977, "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells", Water Resources Research, vol. 12, no. 3, pp. 423-428.

Baildown testing of monitoring wells installed at American Chemical Service, Inc. will be performed as follows:

- o Not less than 24 hours after development of the well, an initial measurement of static water level will be made.
- o A slug of water will then be withdrawn as rapidly as possible using bailers and/or submersible pumps depending on anticipated conditions. Highly permeable conditions ($K \geq 10^{-3}$ cm/sec) are not anticipated.
- o Using a weighted tape or electrical sounding device, water level measurements will be made at the following time intervals (in minutes) -- 0, 0.5, 1, 2, 5, 10, 20, 50 and 100.
- o The data will be plotted in the field (water level vs. log time) using semi-long paper to determine if the data are sufficient to establish a reasonable straight-line relationship.
- o If the data are not sufficient, an additional log cycle of data will be obtained (200, 500 and 1000 minutes).

4.12 STORAGE AND DISPOSAL OF DRILLING AND SAMPLING WASTES

The sampling and drilling activities are expected to generate solid and liquid "wastes". The activities, the anticipated type and amount of waste, and the planned handling of the wastes are summarized below.

- o Waste pit sampling: solid, approximately one half cubic yard of spoil per foot of trench -- returned to excavation upon completion; liquid -- none.
- o Waste boring sampling: solid, auger cuttings and excess soil/cuttings collected but not retained in jars -- returned to borehole upon completion (bentonite plug placed in borehole near surface); liquid -- none.
- o Soil area sampling: solid, any excess soil from that collected for the composite -- returned to holes created by sample collection; liquid -- none.
- o Soil boring sampling: solid, auger cuttings and excess soil/cuttings collected but not retained in jars -- returned to borehole upon completion (bentonite plug placed in borehole near surface); liquid -- none.
- o Monitoring well installation: solid, approximately 1 cubic foot of cuttings per 10 lineal feet of borehole (total of about 80 cubic feet) -- left at borehole locations if on-site, retained in drums for future disposal if off-site; liquids, up to 0.8 gallons per lineal foot of well volume of water removed during well development (total not more than 640 gallons), and up to 0.5 gallons per lineal foot of well volume of water removed for baildown testing (total not more than 400 gallons) -- retained in drums and bulked with other liquid wastes for future disposal.
- o Groundwater sampling: solid -- none; liquid, up to 0.8 gallons per lineal foot of well volume of water purged from wells prior to sampling (total not more than 640 gallons) -- retain in drums and bulk with other liquid wastes for future disposal.
- o Surface water sampling: solid, none, each of nine locations.
- o Sediment sampling: solid, any excess sediment collected in auger but not retained in jars -- left at sampling site; liquid -- none.
- o Private well sampling: no wastes anticipated.

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Disposal of bulked "liquid wastes" will depend on analytical test results of samples taken to characterize the wastes. Sampling will be done in lots of 5 drums each with a composite sample taken from each lot. Testing will be for RCRA (Part 261) hazard criteria and any parameters needed to determine acceptability at a POTW. If the material in a lot is determined to be hazardous that lot will be disposed of at a licensed hazardous waste facility. If the material in a lot is determined not to be hazardous, arrangements will be made to dispose of it through local sanitary sewer/wastewater treatment plant facilities.

SECTION 5

SAMPLE ANALYSIS AND HANDLING

5.1 TESTING PROGRAM

The testing program for the samples collected during implementation of this plan is summarized in Table 1-2. All water sampled (i.e., surface water, private wells and groundwater) will be tested in the field for pH, specific conductance, and temperature. The water, sediment, waste, and soil samples collected for chemical analysis will be tested for the Routine Analytical Services (RAS) organics package, which uses a GC screening followed by GC/MS analysis for quantification of 133 compounds on the Hazardous Substances List and the RAS inorganics package, which includes 24 metals and cyanide. Based on existing analytical data and site conditions, there will be low, medium and high concentration samples.

The water supply samples will be sent to the Central Regional Laboratory (CRL). High hazard samples will be sent to a Hazardous Substances Laboratory. All other samples for chemical analysis will be sent to assigned Contractor Laboratory Program (CLP) facilities. Special Analytical Services (SAS) will be requested for standard RAS organic and inorganic parameters in extracts from high hazard samples. SAS will also be requested for determination of total suspended solids in unfiltered groundwater samples. Sixty-six of the soil samples collected during installation of the monitoring wells will be tested to characterize basic, geotechnical index properties. Twenty samples will be tested for Atterberg Limits, twenty samples will be tested using hydrometer analysis, and twenty samples will be tested using sieve analysis, and six will be tested to determine hydraulic conductivity.

5.2 SAMPLE CONTAINERS AND PRESERVATION

5.2.1 High Hazard Samples

Samples collected for chemical analysis through the CLP that are high hazard, that is those collected from drums, tanks, or spills where they have not been diluted by environmental conditions, will be contained and preserved in accordance with U.S. EPA protocols listed in Table 5-1. These samples are shipped directly to one of the RAS program's Hazardous Substance Laboratories (HSL) for preparation of extracts. The analysis to be performed at the time the high hazard sample preparation is scheduled must be specified to ensure that testing is completed in the same manner as the analytical procedures at the CLP or regional laboratory. All high hazard samples are placed into 8-ounce wide-mouth glass jars, sealed into paint cans, and marked as hazardous. No preservatives are required for high hazard samples.

TABLE 5-1

REQUIRED SAMPLE CONTAINERS AND PRESERVATION
FOR SAMPLES TESTED BY A HAZARDOUS SUBSTANCE LABORATORY

Organics in Water and Liquids (High Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
All organic analysis	One 8-ounce wide-mouth glass jar with Teflon-lined cap; filled to 3/4 full	None required

Inorganics in Water and Liquids (High Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
All inorganic analysis	One 8-ounce wide-mouth glass jar; filled to 3/4 full	None required

Organics in Soil and Sediment (High Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
All organic analysis	One 8-ounce, wide-mouth, glass jar with Teflon-lined cap; filled to 3/4 full	None required

Inorganics in Soil and Sediment (High Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
All inorganic analysis	One 8-ounce, wide-mouth glass jar; filled to 3/4 full	None required

Note: All high hazard sample bottles must be shipped in paint cans as hazardous to one of the RAS program's Hazardous Substance Laboratory.

5.2.2 Medium Hazard Samples

Medium hazard samples collected through the CLP will be contained, preserved and shipped as appropriate for the intended testing and in accordance with U.S. EPA protocols listed in Table 5-2. Medium hazard samples are those that have originated from drums or residues, but that have been diluted somewhat by environmental conditions. All medium hazard sample containers will be placed in paint cans and marked as hazardous. The amount of sample required is listed in Table 5-2. In all other respects, medium hazard samples are treated in the same manner as low hazard samples.

5.2.3 Low Hazard Samples

Samples collected for chemical analysis through the CLP will be contained and preserved as appropriate for the intended testing and in accordance with U.S. EPA protocols listed in Table 5-2. Samples collected for chemical analysis by the CRL will be contained and preserved in accordance with the protocols listed in Table 5-3. If necessary, samples will be placed on ice immediately after collection to maintain a temperature of 4°C.

Most groundwater samples (from all 40 wells) collected for RAS inorganics metals analysis will be filtered in the field as soon as possible after collection and prior to the addition of nitric acid preservative. Filtering will be done with a pressure filtration device and 0.45 micron filter paper. The surface water samples (from all 9 locations), all private well samples, and seven groundwater samples collected for metals analysis will not be filtered prior to acid preservation.

5.3 SAMPLE PACKAGING AND SHIPMENT

5.3.1 High Hazard Samples

In preparation for shipment to the analytical laboratories, all samples will be packaged in accordance with the following procedures:

- o Tighten cap securely and seal with tape; mark liquid levels if bottles are partially full.
- o Place all containers into paint cans and fill with vermiculite.

TABLE 5-2

REQUIRED SAMPLE CONTAINERS AND PRESERVATION
FOR SAMPLES TESTED BY CLP

Organics in Water and Liquids (Medium Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Extractables (acid, base/neutral, pesticides/PCB)	Four 32-ounce, wide- mouth glass jars with Teflon-lined caps; filled to neck	None Required
Volatiles	Two 40-ml VOA vials with Teflon-lined caps; completely filled--no air bubbles	None Required

Inorganics in Water and Liquids (Medium Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Metals	One 16-ounce, wide- mouth glass amber bottle; filled to shoulder	1:1 HNO ₃ to pH <2
Cyanide	One 16-ounce wide- mouth glass amber bottle; filled to shoulder	6N NaOH to pH >12
Total suspended solids	One 500-ml high density polyethylene bottle; filled to shoulder	None Required

TABLE 5-2 (Continued)

REQUIRED SAMPLE CONTAINERS AND PRESERVATION
FOR SAMPLES TESTED BY CLP

Organics in Soil and Sediment (Medium Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Extractables (acid, base/neutral, pesticides/PCB)	One 8-ounce, wide- mouth, glass jar with Teflon-lined lid; filled about 3/4 full	None Required
Volatiles	Two 120-ml glass vials with Teflon- lined lid; filled as completely as possible.	None Required

Inorganics in Soil and Sediment (Medium Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Metals and Cyanide	One 8-ounce, wide- mouth glass jar; filled about 3/4 full	None Required

Note: All medium hazard sample bottles must be shipped in paint cans marked as hazardous.

Note: Water samples collected for duplicate analysis of organics must be collected at double the volume specified for extractables and at triple the volume specified for volatiles. In addition, one volatile trip blank (distilled-deionized water poured directly into two 40-ml vials) should be supplied per shipment.

TABLE 5-2 (continued)

REQUIRED SAMPLE CONTAINERS AND PRESERVATION
FOR SAMPLES TESTED BY CLP

Organics in Water and Liquids (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Extractables (acid, base/neutral, pesticides/PCB)	Two 1/2-gallon glass amber bottles with Teflon-lined caps; filled to neck	Iced to 4°C
Volatiles	Two 40-ml VOA vials with Teflon-lined caps; completely filled--no air bubbles	Iced to 4°C

Inorganics in Water and Liquids (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Metals	One 1-liter high density polyethylene bottle; filled to shoulder	1:1 HNO ₃ to pH <2
Cyanide	One 1-liter high density polyethylene bottle; filled to shoulder	6N NaOH to pH >12
Total suspended solids	One 500-ml high density polyethylene bottle; filled to shoulder	None Required

TABLE 5-2 (Continued)

REQUIRED SAMPLE CONTAINERS AND PRESERVATION
FOR SAMPLES TESTED BY CLP

Organics in Soil and Sediment (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Extractables (acid, base/neutral, pesticides/PCB)	One 8-ounce, wide- mouth, glass jar with Teflon-lined lid; filled about 3/4 full	Iced to 4°C
Volatiles	One 8-ounce glass vial with Teflon- lined lid; filled as completely as possible.	Iced to 4°C

Inorganics in Soil and Sediment (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Metals and Cyanide	One 8-ounce, wide- mouth glass jar; filled about 3/4 full	Iced to 4°C (optional)

Note: Water samples collected for duplicate analysis of organics must be collected at double the volume specified for extractables and at triple the volume specified for volatiles. In addition, one volatile trip blank (distilled-deionized water poured directly into two 40-ml vials) should be supplied per shipment.

TABLE 5-3

REQUIRED SAMPLE CONTAINERS AND PRESERVATION
 FOR SAMPLES TESTED BY CRL

Organics in Private Well Samples (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Acid extractables, base neutral extractables	Three 1/2-gallon glass amber bottles (Teflon- lined caps): filled to neck.	cool, 4°C
Pesticides/PCB's	Three 1/2-gallon glass amber bottles (Teflon- lined caps): filled to neck.	cool, 4°C
Volatiles	Three 40-ml volatile organic analysis (VOA) vials: filled completely with no air bubbles.	cool, 4°C

Inorganics in Private Well Samples (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Metals	One 1-liter high density polyethylene bottle, filled to shoulder.	5 ml 8N HNO ₃ to pH <2, iced to 4°C optional
Cyanide	One 1-liter poly- ethylene bottle, filled to shoulder.	5 ml 6N NaOH to pH >12, cool, 4°C
Minerals Alkalinity Chloride Fluoride Sulfate	One 500-ml poly- ethylene bottle, filled to shoulder.	cool, 4°C room temperature room temperature room temperature

TABLE 5-3 (continued)

REQUIRED SAMPLE CONTAINERS AND PRESERVATION
FOR SAMPLES TESTED BY CRL

Inorganics in Water Supply Samples (Low Concentration)-continued

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Nutrients	One 1-liter polyethylene	1 ml conc. H_2SO_4
Ammonia	bottle: filled to	to pH <2
TKN	shoulder	cool, 4°C TKN
NO_3^- - NO_2^-		
TOC		
Total Phosphorus		

Note: Water samples collected for duplicate analysis of organics must be collected at double the volume specified for extractables and at triple the volume specified for volatiles. In addition, one volatile trip blank (distilled-deionized water poured directly into two 40-ml vials) should be supplied per shipment.

- o Make sure traffic report labels and custody tags are securely attached to the sample container; place each container in a zip-loc baggie, ensuring that labels can be read.
- o Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material; surround each sample and fill remaining space in cooler with additional packing material.
- o Put chain-of-custody forms and traffic reports in a manilla envelope; place envelope in a zip-loc baggie and tape to inside of cooler lid.
- o Close cooler and seal shut with strapping tape; if cooler has a drain port, seal it shut with tape; place custody seals across closure at front of cooler.
- o Mark cooler with proper labels indicating hazardous substances.
- o Affix airbill with shipper's and consignee's addresses to top of cooler; if samples are liquid, place "This End Up" labels appropriately.
- o Ship to a Hazardous Substances Laboratory.

High hazard samples will be shipped within 24 hours of collection via Federal Express, Purolator, or Emery for next-day delivery. The Sample Management Office will be notified of each shipment as it is made.

5.3.2 Medium Hazard Samples

Medium hazard samples will be packaged in the same manner as high hazard samples, but are analyzed by the CLP, rather than a Hazardous Substances laboratory. Organics samples will be shipped within 24 hours of collection via Federal Express, Purolator, or Emery for next-day delivery. Inorganics samples will be shipped within 48 hours of collection for two-day delivery. The Sample Management Office will be notified of each shipment as it is made.

5.3.3 Low Hazard Samples

In preparation for shipment to the analytical laboratories, all samples will be packaged in accordance with the following procedures:

- o Check to make sure that sample is properly preserved; tighten cap securely and seal with tape; mark liquid levels if bottles are partially full.

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- o Make sure traffic report labels and custody tags are securely attached to the sample container; place each container in a zip-loc baggie, ensuring that labels can be read.
- o Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material; surround each sample and fill remaining space in cooler with additional packing material.
- o Put chain-of-custody forms and traffic reports in a manilla envelope; place envelope in a zip-loc baggie and tape to inside of cooler lid.
- o Close cooler and seal shut with strapping tape; if cooler has a drain port, seal it shut with tape; place custody seals across closure at front of cooler.
- o Affix airbill with shipper's and consignee's addresses to top of cooler; if samples are liquid, place "This End Up" labels appropriately.

Organics samples will be shipped within 24 hours of collection via Federal Express, Purolator, or Emery for next-day delivery. Inorganics samples will be shipped within 48 hours of collection for two-day delivery. The Sample Management Office will be notified of each shipment as it is made.

SECTION 6

SAMPLE DOCUMENTATION AND TRACKING

6.1 FIELD RECORDS

Field observations and other pertinent information pertaining to the collection of samples will be recorded in bound log books using black ink. Assignment of field logbooks will be recorded on a daily basis in the master log book. Notebooks shall be assigned to field personnel. Each notebook will be identified as the Document Control Number. The cover of the notebook contains the following information: organization, book number, project name, start date, and end date.

Standard formats will be developed so that data relating to the collection of each type of sample and to the installation of monitoring wells are consistently recorded. These formats will be converted into rubber stamps to reduce the amount of writing required by the sampling team. The data to be recorded will include date, time, samplers, level of personnel protection being use on-site, location, sample number, custody tag number, weather, instrument readings and visual description of sample, and the signature of the person making the entry, in addition to other data specific to each sample type. The standard formats are presented in Tables 6-1 to 6-9. In addition to written records, photographs will be taken as needed to further clarify sampling activities. The film roll number and number of photographs taken at each sampling location will be noted.

6.2 CHAIN-OF-CUSTODY PROCEDURES

All samples will be collected and handled in accordance with the chain-of-custody procedures below:

- o All information required on the custody tag, including the signatures of all sampling team members and a predesignated location description, will be filled out in the field.
- o Prior to relinquishing samples for packaging and shipment, one member of the sampling team will transfer all data contained on the custody tags to a chain-of-custody record, which all team members will sign.
- o The individual who prepared the chain-of-custody record will relinquish the samples to the sample handling technician, who will prepare all CLP traffic reports and affix appropriate traffic report labels to the sample containers.

1

[Per Day Post At]

[FOR EACH SAMPLE]

TABLE 6-2 STANDARD FORMAT TEST BORING SAMPLE COLLECTION

ACS. INC.	TEST BORING SAMPLING	LOGGED BY:
DATE:	LOCATION:	
SAMPLERS:		
WEATHER:		
TIME DRILLING BEGAN:		HRS
TIME DRILLING ENDED:		HRS
LOCATION AND DESCRIPTION:		
HAMMER WEIGHT: 140 LBS - 370 LBS		
BLOW COUNTS / RECOVERY		
0-1.5 FT		
1.5-3.0 FT		
3.0-4.5 FT		
4.5-6.0 FT		
6.0-7.5 FT		
7.5-9.0 FT		

BLOW COUNTS / RECOVERY
9.0-10.5
10.5-12.0
12.0-13.5
13.5-15.0
15.0-16.5
16.5-18.0
18.0-19.5
19.5-21.0
21.0-22.5
22.5-24.0
24.0-25.5
25.5-27.0
27.0-28.5
28.5-30.0

TABLE 6-2 (continued) STANDARD FORMAT TEST BORING SAMPLE COLLECTION

FIELD SAMPLE NO.:	
DEPTH INTERVAL:	
TIME SAMPLE COLLECTED:	HRS
SAMPLE DESCRIPTION:	
ORGANIC VAPOR SCREENING - BOREHOLE	
OVAs:	TPM
HAZAR:	PPM STANDARD:
SAMPLE:	OVAs (PPM) HAZAR (PPM)
TOP (C)	
MIDDLE (B)	
BOTTOM (A)	
CUSTODY TAG NUMBERS:	
EXTRACTABLES:	
VOLATILES:	
INORGANICS:	
REMARKS:	

[FOR EACH SPLIT SAMPLE]

ACS, TX		LOGGED BY:
SOIL AREA SAMPLING		
DATE:	AREA:	
FIELD SAMPLE NO.:		
SAMPLES:		
WEATHER:		
TYPE COLLECTION METHOD:		hrs
TIME COLLECTION ENDED:		hrs
DEPTH INTERVAL:		inches
AREA DESCRIPTION:		
SITE DESCRIPTIONS:		
1)		
2)		
3)		
4)		
5)		

SOIL DESCRIPTIONS:	
1)	
2)	
3)	
4)	
5)	
CUSTOMER TAG NUMBERS:	
EXTRACTABLES:	
VOLATILES:	
INORGANICS:	
REMARKS:	

TABLE 6-4 STANDARD FORMAT SOIL BORINGS SAMPLE COLLECTION

ACS INC.	LOGGED BY:	
SOIL BORING SAMPLING		
DATE:	LOCATION:	
SAMPLERS:		
WEATHER:		
TIME DRILLING BEGAN:		HRS
TIME DRILLING ENDED:		HRS
LOCATION DESCRIPTION:		
HAMMER WEIGHT: 140 LBS		3.00 LBS
BLOW COUNTS / RECOVERY		
0-1.5 FT	/	
1.5-3.0 FT	/	
3.0-4.5 FT	/	
4.5-6.0 FT	/	
6.0-7.5 FT	/	
7.5-9.0 FT	/	
[FOR EACH BOREHOLE]		

FIELD SAMPLE NO.:	
DEPTH INTERVAL:	
TIME SAMPLE COLLECTED:	HRS
SAMPLE DESCRIPTION:	
ORGANIC VAPOR SCREENING - BOREHOLE	
OVN: ppm	
HAN: ppm	
SAMPLE OVA (ppm)	HAN (ppm)
TOP (C)	
MIDDLE (B)	
BOTTOM (A)	
CUSTODY TAG NUMBERS:	
EXTRACTABLES:	
VOLATILES:	
INORGANICS:	
REMARKS:	
[FOR EACH SPLIT-SAMPLE]	

TABLE 6-5 STANDARD FORMAT MONITORING WELL INSTALLATION

ACS TAG	LOGGED BY	FIELD SAMPLE NO.
WELL INSTALLATION		TIME SAMPLE COLLECTED
		HR
LOCATION	UNIT	SAMPLE TYPE: SPLIT SPOON -- SHELBY TUBE
		DEPTH INTERVAL
INSTALLERS		BLOW COUNTS (SPT) / RECOVERY (INCHES)
WEATHERS		SAMPLE DESCRIPTION
LOCATION DESCRIPTION		ORGANIC VAPOR SCREENING -- BOREHOLE
		QVA
		PPM
TIME DRILLING BEGAN		PPM STAY POT
DATE	HR	
TIME DRILLING ENDED		SAMPLE QVA (PPM)
DATE	HR	TOP (C)
TIME INSTALLATION BEGAN		MIDDLE (B)
DATE	HR	BOTTOM (A)
TIME INSTALLATION ENDED		
DATE	HR	CUSTODY TAG NOS: (C)
TIME DEVELOPMENT BEGAN		(B)
DATE	HR	(A)
TIME DEVELOPMENT ENDED		REMARKS
DATE	HR	

TABLE 6-5 (continued) STANDARD FORMAT MONITORING WELL INSTALLATION

TOTAL DEPTH OF BORING:	FEET
CASING FLUSHED CLEAN: YES--NO	
WELL CONSTRUCTION:	
SCREEN LENGTH:	FEET
SLOT TYPE: MILLED -- CONTINUOUS	
SLOT SIZE:	INCHES
WELL DIAMETER:	INCHES
RISER LENGTH:	FEET
RISER MATERIAL:	
COMPACTION METHOD:	
DEPTH TO TIP OF SCREEN:	FEET
ANNULUS BACKFILLING (FEET)	
CONCRETE:	TO
C/B GROUT:	TO
PELLET SEAL:	TO
FLINT SAND:	TO
CAVED SOIL:	TO
FLINT SAND:	TO
PELLETS & SAND:	TO
DEPTH OF SENSING ZONE:	FEET

FORM NO. MW-17

PROTECTIVE CASING:	
DIAMETER:	INCHES
LENGTH:	FEET
STUCK-UP:	FEET
LOCKING: YES--NO	
WELL DEVELOPMENT:	
TOTAL WATER DEPTH:	FEET
VOLUME IN WELL:	GALLS
VOLUME REMOVED:	GALLS
SURGE ID PUMP CYCLES: 1-2-3-4-5	
FINAL DISCHARGE CLEAR: YES--NO	
REMARKS:	

TABLE 6-6 STANDARD FORMAT GROUNDWATER SAMPLE COLLECTION

ACS, INC.		LOGGED BY:	
GROUNDWATER SAMPLES:			
DATE:	LOCATION:		
FIELD SAMPLE NO.:			
SAMPLES:			
WEATHER:			
INITIAL WATER DEPTH:		FEET	
TOTAL WELL DEPTH:		FEET	
WATER VOLUME IN WELL:		GALS.	
TIME PURGING BEGAN:		HRS	
TIME PURGING ENDED:		HRS	
DID WELL GO DRY:	YES--NO		
WATER VOLUME PURGED:		GALS	
LOCATION DESCRIPTION:			

TIME COLLECTION BEGAN:	HRS
TIME COLLECTION ENDED:	HRS
SAMPLE DESCRIPTION:	
FIELD MEASUREMENTS	
PH	standard units
Spec. Cond:	µmhos/cm
TEMPERATURE:	°C
METALS FIELD FILTERED:	YES--NO
CUSTOMER TAG NUMBERS:	
EXTRACOLUMNS:	
VIOLATIONS:	
METALS:	
CYANIDES:	
REMARKS:	

[FOR EACH SAMPLE]

ACS, INC.	LOGGED BY:
SURFACE WATER SAMPLING	
DATE:	LOCATION:
FIELD SAMPLE NO.:	
SAMPLERS:	
TIME SINCE LAST RUNOFF:	DAYS
WEATHER:	
TIME COLLECTING BEGAN:	HRS
TIME COLLECTING ENDED:	HRS
INTERMEDIATE BOTTLE USED:	YES-- NO
LOCATION DESCRIPTION:	
SAMPLE DESCRIPTION:	

FIELD MEASUREMENTS:	
pH:	standard units
SPEC. COND:	umhos/cm
TEMPERATURE:	°C
METALS FIELD FILTERED: YES - NO	
CUSTODY TAG NUMBERS	
EXTRACTABLES:	
VOLATILES:	
METALS:	
CYANIDE:	
REMARKS:	

TABLE 6-8 STANDARD FORMAT SEDIMENT SAMPLE COLLECTION

[illegible][illegible]

[FOR EACH SAMPLE]

TABLE 6-9 STANDARD FORMAT WATER SUPPLY SAMPLE COLLECTION

ACS ID#		LOGGED BY:	
PRIVATE WELL SAMPLING			
DATE		LOCATION:	
FIELD SAMPLE NO.:			
SAMPLERS:			
WEATHER:			
PUMP OPERATING STATUS: (DATE & DURATION)			
TIME LOCATION:			
TIME COLLECTION BEGINS:		HRS	
TIME COLLECTION ENDS:		HRS	
LOCATION DESCRIPTION:			
SAMPLE DESCRIPTION:			

FIELD MEASUREMENTS:	standard units
pH:	
SPEC. COND:	umhos/cm
TEMPERATURE:	°C
METALS FIELD FILTERED: YES - F NO -	
CLUSTERY TRAC ADJUNCTS	
B/N/A EXTRACT:	
PEST & PCBs:	
VOLATILES:	
METALS:	
CYANIDE:	
MINERALS:	
NUTRIENTS:	
REMARKS:	

1-12-11 11:00 AM

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- o The technician will package the samples for shipment making sure that all traffic reports, chain-of-custody records and custody seals are cross-referenced and that all sample documentation paper work is enclosed.
- o If samples are stored temporarily prior to shipment, they will be kept cool and placed in a secured storage area. Coolers will be sealed and custody seals affixed just prior to shipment.

The sample handling technician will maintain lists cross-referencing site sample numbers, custody tag numbers, traffic report numbers, analyses to be performed, custody seal numbers, shippers' airbill numbers, and consigned laboratories in a bound log book using black ink. (For detailed guidance on completing chain-of-custody and sample tracking paperwork, refer to "Sampling Handbook, U.S. EPA TAT, Region V, Revised 1985.")

SECTION 7

SAMPLING TEAM ORGANIZATION

The sampling team will consist of nine individuals whose roles and responsibilities are as follows:

- o Field Manager--responsible for overall execution of the field program and sampling plan; will coordinate and expedite drilling activities for the borings and monitoring well installations, test pit excavation, and other sampling activities; will coordinate procurements and communications.
- o Site Safety Officer and Assistant Safety Officer -- responsible for implementation of the site safety plan as contained in the site evaluation form (SEF); will operate OVA and HNU instruments for screening of soil samples during drilling and test pitting activities; will direct a two-man sampling team during some of the other sampling activities.
- o Field Supervisors (2) -- responsible for overseeing, directing, and documenting sampling activities, including drilling for borings and monitoring well installation, test pitting, and other sample collection; will be assisted by sample collectors.
- o Sample Collectors (2) -- primarily involved in sample collection, may assist with decontamination and/or sample handling; will have the "dirty hands" during drilling and test pitting activities and when sampling with the supervisors or safety officers.
- o Decontamination Technician--primarily involved in decontamination of sampling equipment and sampling team personnel, may assist with sample collection and/or sample handling.
- o Sample Handling Technician--primarily involved in sample packaging and processing of sample custody and tracking paper work, may assist with decontamination.

During boring and monitoring well installation activities, there will also be a driller and a helper from the firm subcontracted to provide drilling services present on site. During test pitting activities there will be an operator for the backhoe, and during geophysical surveying there will be an operator for the equipment.

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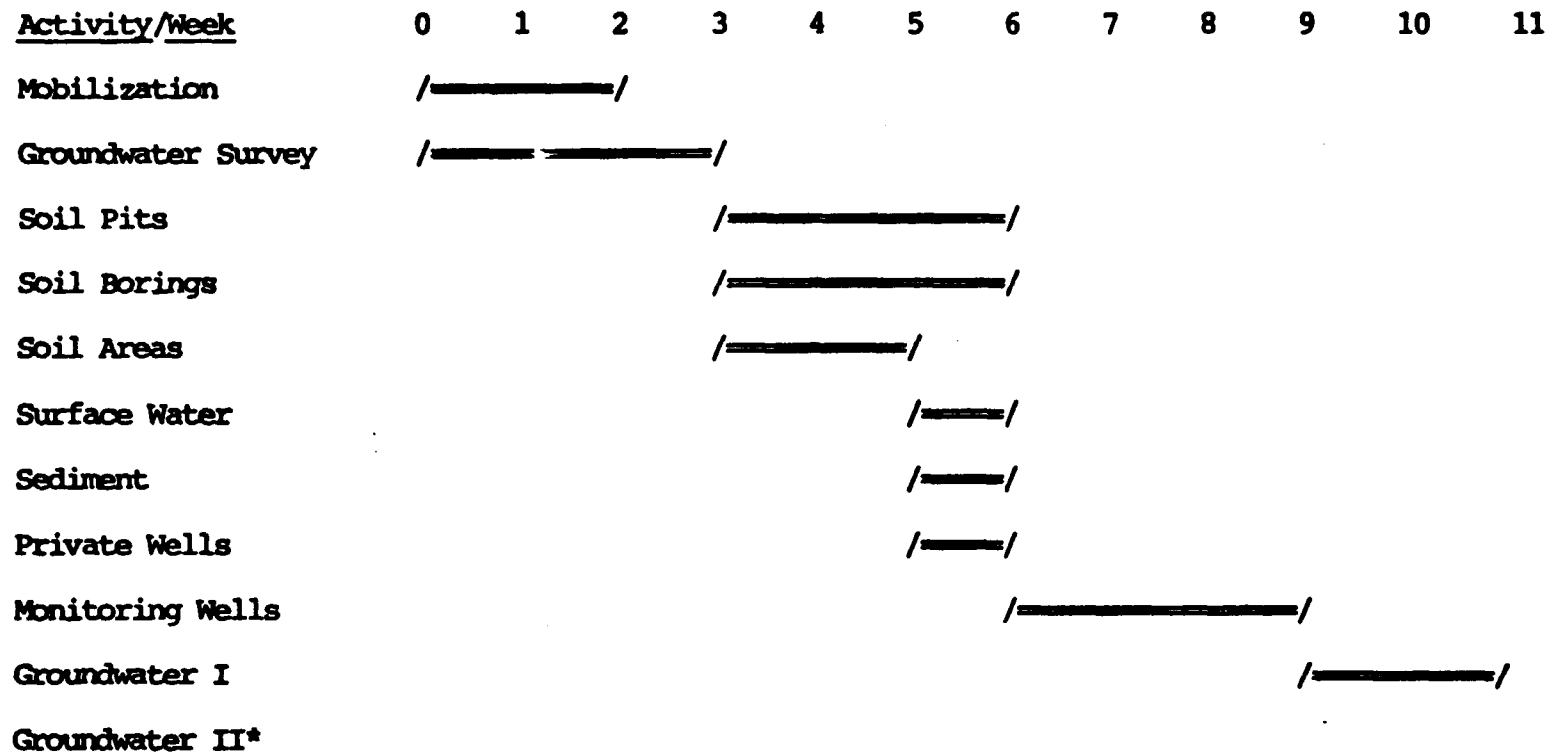
SECTION 8

SCHEDULING

The schedule for this sampling plan is shown in Figure 8-1. Mobilization will require about five days. This includes setting up office and decontamination facilities and stockpiling materials and equipment. Boundary and grid surveying and geophysical work will last about one week. Test pitting, borings and other waste characterization activities are estimated to require three weeks to complete. Private well and surface water and sediment sampling can occur concurrently during this same three week period. Monitoring well installations are estimated at a total of about 15 working days, assuming two drilling rigs are used. Groundwater sampling is estimated at two weeks. The total duration of the primary field effort from the beginning of mobilization is 11 weeks. The second round of water supplies and groundwater sampling should only take one week, and is shown as occurring one month after the major field effort.

FIGURE 8-1

SAMPLING PLAN SCHEDULE



*Note: Second round of groundwater sampling will occur one month after first round.

APPENDIX A

**Procedures for Field Measurement of pH, Specific
Conductance and Temperature of Water Samples**

4.3 SOIL AREA SAMPLES

Samples of surficial soil material will be collected from six on-site areas in the Drum Storage Area and two off-site areas in the former Kapica Drum property. Within most of the six on-site areas, soil material will be collected at five discrete sites and composited to form two samples for that area (one composite sample for each depth interval). The soil will be collected from depths of 6 to 12 inches and 18 to 24 inches using a 4-inch diameter bucket. When the auger is filled with a sample material from one of the depth intervals, it will be brought to a central location within the area where its contents will be emptied onto a sheet of Teflon. The soil on the Teflon sheet will be covered with plastic until all five sites have been sampled at that depth interval. The composite sample will be placed in the sample bottles after being thoroughly mixed with stainless steel spatulas. The auger will be decontaminated in accordance with the standard protocol presented in Table 4-1 prior to each use, and the Teflon sheet and spatulas will be decontaminated between each area.

Within each off-site area, soil material will be collected from two depth intervals at five sites to form two composites for that area. First, a 4-inch bucket auger will be used to collect soil material to a depth of 6 to 12 inches at each of the three sites. These materials will be mixed on a Teflon sheet as described above and placed in sample containers. After decontaminating the Teflon sheet and spatulas, the auger (decontaminated prior to each use) will be used to collect soil material to a depth of 12 to 18 inches at the same three sites. These materials will be mixed and placed in sample containers as described.

Grab samples will be collected at two specific areas: near the fume incinerator and at the site of a spill/fire. The soil will be collected from depths of 6 to 12 inches and 18 to 24 inches at both sites using a 4-inch diameter bucket. When the auger is filled with material from one of the depth intervals its contents will be emptied onto a sheet of Teflon. The grab sample will be placed in a sample bottle. All equipment will be decontaminated prior to each use.

For each of the sixteen samples, the soil material collected at each depth interval will be qualitatively screened with an OVA and HNu instruments. The instrument readings and soil material description will be entered into the sampling logbook.

The sampling team for this task (4.3) will consist of three people and will be in level C with a contingency of level B. Downgrading to level D will be kept on as an option if environmental monitoring indicate that it is safe. Authorization to downgrade must come from the SSO.

4.4 SOIL BORING SAMPLES

Soil borings will be performed at six on-site locations in the Drum Storage Area. Each boring will be sampled continuously from the ground surface to the water table. Samples will be collected using a 3-inch diameter split-spoon device that will be driven into the ground in consecutive 18-inch intervals. The over-sized split-spoon is needed to provide enough sample for standard CLP analyses, especially when duplicates are collected.

Upon recovery from the borehole, the sampler will be placed on a clean Teflon sheet and opened. As the spoon is opened, the soil material will be qualitatively screened with OVA and HNu instruments and described by a qualified geologist or geotechnical engineer. The instrument readings and soil description will be entered in the sampling logbook. The soil material will then be divided into three six-inch samples and placed in separate sample containers using stainless steel spatulas. If less than 18-inches of soil is recovered by the split-spoon, the geologist or geotechnical engineer will use his judgement to assign depth intervals to the recovered material. Three six-inch samples will be sent to the laboratory for each boring location. The samples to be analyzed are those having depths of 1, 2, and 4 feet at the top of the sample increment.

The boring will be advanced using hollow stem augers or other methods approved by the geologist that do not use drilling fluids. The split spoons, Teflon sheet and spatulas, will be decontaminated in accordance with the standard protocol presented in Table 4-1 prior to each use. The drilling rig and all related equipment and tools used at one boring will be steam-cleaned prior to re-use.

The sampling team for this task (4.4) will consist of three people and will be in level C with a contingency of level B. Downgrading to level D will be kept on as an option if environmental monitoring indicate that it is safe. Authorization to downgrade must come from the SSO.

4.5 MONITORING WELL INSTALLATION

A total of 40 monitoring wells will be installed at 24 separate locations. Six locations will have well-nests consisting of three wells, another four locations will have well-nests consisting of two wells, eight locations will have one water-table well each and six locations will have one well screened the full length of the upper aquifer. The three-well nests consist of a well in the water supply aquifer at a depth of about 50 feet, a well at the base of the upper aquifer at a depth of about 20 feet, and a well at the water table at a depth of about 10 feet. The two-well nests consists of wells at about 20 feet and 10 feet, the single water-table wells will be at about 10 feet and the single fully penetrating well will have a depth of 20 feet. Total drilling footage is approximately 800 feet.

All personnel involved in monitoring well installation will be in level C with a contingency of level B. Downgrading to level D will be kept on as an option if environmental monitoring indicated it is safe. Authorization to downgrade must come from the SSO.

4.5.1 Three-Well Nests

Monitoring well installation will begin at the locations having three-well nests. The deepest well will be installed first so that the shallower soil stratigraphy is mostly defined prior to installation of those wells. The following procedures will be used to install the monitoring wells in the water supply aquifer:

- o The working end of the drilling rig and all equipment, tools and materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from coming into contact with surficial soils during drilling and well installation.
- o The borehole will be advanced using wash rotary drilling methods with 6-inch casing (or hollow stem augers) advanced continuously ahead of the open hole and clean water as the recirculated drilling fluid. When the borehole is about 15 feet into the silty clay unit or at a depth of about 35 feet, 4-inch casing will be telescoped through the 6-inch casing, the existing tank of drilling fluid will be discarded, and a clean tank of drilling fluid will be used to drill the rest of the boring.
- o Samples will be collected using standard split-spoon and Shelby tube samplers. Samples will be collected at 2.5-foot intervals to a depth of 35 feet, and at 5-foot intervals to the bottom of the boring. As each sample is recovered, it will be qualitatively screened for organic vapors using OVA and HNu instruments. The instrument readings and soil description will be entered into a sampling logbook. The boring will be logged by a geologist or geotechnical engineer and the samples retained for future reference and possible geotechnical index testing.
- o Drilling and sampling will proceed until the borehole has penetrated 5 to 10 feet into the water supply aquifer. Upon completion of drilling, the borehole will be flushed with clean water to remove all suspended solids from the inside of the casing.
- o The well will be constructed out of 2-inch diameter, low carbon steel with flush-threaded couplings and a five-foot screened interval at the bottom. The screen will be factory mill-slotted or continuously slotted with openings of 0.010 inches.

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- o If needed, the annular space around the screen will be backfilled with a silt-free flint sand to a height at least two feet above the top of the screen. A two-foot seal of compressed bentonite pellets will be placed above the sand pack, and the remaining annular space will be filled with a cement-bentonite grout placed with a tremie pipe.
- o A four-inch diameter, locking protective casing will be installed at the surface with a concrete anchor and runoff diversion apron. The steel riser will be covered with a loosely fitting, vented steel cap. Locks will be provided. Three vehicle-bumper posts will be installed around the well if it is to be located in a traffic area.
- o The well will be developed by surging and pumping until five well volumes have been removed and clear water is obtained during pumping. Upon completion of development, a bail-down recovery test, as described in subsection 4.11, will be performed to document the sensitivity of the well and provide data for calculating the hydraulic conductivity of the screened interval.

The wells screened at the base of the upper aquifer at these locations (three-well nests) will be installed using procedures similar to those described above except that:

- o The hole may be started with 4-inch casing (or 6-inch hollow stem augers), and the drilling fluid need not be changed.
- o Samples will be obtained at 5-foot intervals for the entire depth of the boring.
- o The depth of the boring, and consequently the depth of the screened interval, will be determined in the field on the basis of soil stratigraphy and possible contaminant concentrations identified in the deep boring.

The shallow wells at these locations will be installed using similar procedures except that:

- o The depth of the boring will be determined in the field and will be screened at the water table.
- o The screened interval will extend from the bottom of the boring to within three feet of the surface.
- o Extra care will be taken to ensure that the annulus of the well is completely sealed against surface runoff.

The details of well construction for three-well nests are shown schematically in Figure 4.1.

4.5.2 Two-Well Nests

Monitoring wells at locations having two-well nests will be installed next. The deeper well will be installed first using the following procedures:

- o The working end of the drilling rig and all equipment, tools and materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from coming into contact with surficial soils during drilling and well installation.
- o The borehole will be advanced using wash rotary drilling methods with 4-inch casing (or 6-inch hollow stem augers) advanced continuously ahead of the open hole and clean water as the recirculated drilling fluid.
- o Samples will be collected using standard split-spoon and Shelby tube samplers. Samples will be collected at 2.5-foot intervals to the bottom of the boring. As each sample is recovered, it will be qualitatively screened for organic vapors using OVA and HNu instruments. The instrument readings and soil description will be entered into a sampling logbook. The boring will be logged by a geologist or geotechnical engineer and the samples retained for future reference and possible geotechnical index testing.
- o Drilling and sampling will proceed until the borehole has penetrated 3 to 5 feet into the gray silty clay unit. Upon completion of drilling, the borehole will be flushed with clean water to remove all suspended solids from the inside of the casing. The borehole will be backfilled with a mixture of compressed bentonite pellets and sand to the depth selected for the bottom of the screen.
- o The well will be constructed out of 2-inch diameter, low carbon steel with flush-threaded couplings and a five-foot screened interval at the bottom. The screen will be factory mill-slotted or continuously slotted with openings of 0.010 inches.
- o The annular space around the screen will be backfilled with a silt-free flint sand to a height at least two feet above the top of the screen. A two-foot seal of compressed bentonite pellets will be placed above the sand pack, and the remaining annular space will be filled with a cement-bentonite grout placed with a tremie pipe.

Field Measurement of pH in Water

1. Scope and Application

This method is applicable to samples of stormwater, surface water, water supplies and groundwater with measurement occurring at the sampling location.

2. Summary of Method

The pH of water is determined using a portable, field pH meter with a temperature-compensated combination electrode.

3. Apparatus

- A) Haake Buchler pH Meter Stick
- B) 100 ml disposable beakers

4. Reagents

A) pH reference buffer solutions:

- 1) pH = 4.00 \pm 0.01
- 2) pH = 7.00 \pm 0.01
- 3) pH = 10.00 \pm 0.01

B) distilled water

5. Sample Handling and Preparation

Sample aliquots for pH measurement should be obtained directly from the sampling point in 100 ml disposable beakers. Groundwater samples being tested during well purging can be obtained from the pump discharge line.

6. Calibration

Calibrate the meter/electrode using two reference solutions that bracket the expected pH of the sample. Reference solutions should be at room temperature. Immerse the electrode in pH 7.00 solution and adjust the meter as needed. Remove and rinse the electrode and repeat using the second buffer solution. Repeat adjustments until readings are within 0.05 pH units of the reference values.

7. Procedure

Immerse the electrode in the water while gently agitating. After about one-half minute, record the pH reading to the nearest 0.05 units -- provided the meter readings are not fluctuating more than ± 0.03 units. Be sure that temperature compensation has been provided for. Remove and thoroughly rinse the electrode with distilled water. Repeat the measurement procedure until four readings have been obtained.

8. Interferences

Prolonged immersion of the electrode in turbid solutions can lead to plugging of the liquid junction and erratic meter readings. The electrode should be cleaned by gently blotting with a lab tissue and rinsing with distilled water.

9. Verification of Accuracy

Following the last of the four replicate measurements, immerse the rinsed electrode in each of the reference buffer solutions used to calibrate the meter/electrode prior to sample measurements. If the readings are not within 0.05 units of the reference values, recalibrate the meter/electrode and re-do the measurement of the sample just tested.

10. Assessment of Precision

Calculate the mean and standard deviation of the four replicate measurements. If the standard deviation is greater than 0.1 units, re-do the measurement of the sample just tested including calibration and verification.

11. Reporting

Report the average value of the replicate measurements to the nearest 0.1 units.

12. Preventative Maintenance

Preventative Maintenance will be performed in accordance with manufactures instructions.

Field Measurement of Specific Conductance and Temperature

1. Scope and Application

This method is applicable to samples of stormwater, surface water, water supplies and groundwater with measurement occurring at the sampling point.

2. Summary of Method

The specific conductance and temperature of water is determined using a portable, field conductivity meter having manual temperature compensation.

3. Apparatus

- A) YSI Model 33 S-C-T Meter with weighted probe
- B) 100 ml disposable beakers

4. Reagents

- A) 0.01 N KCl reference solution
- B) distilled water

5. Sample Handling and Preparation

Sample aliquots for specific conductance and temperature should be obtained directly from the sampling point in 100 ml disposable beakers. Groundwater samples being tested during well purging can be obtained from the pump discharge line.

6. Calibration

Calibrate the thermometer in the probe against the thermometer in the field laboratory. Readings should be within $\pm 1^{\circ}\text{C}$. Calibrate the specific conductance meter using the 0.01 N KCl reference solution. The specific conductance of this solution is 1413 $\mu\text{mhos/cm}$ at 25°C . Adjust the meter as needed. Temperature calibration should be performed weekly. Specific conductance calibration should be performed daily during the period of use.

7. Procedure

Check battery condition by turning selector dial to "Red Line". Adjust meter as needed. Immerse the probe in the beaker while gently agitating. Turn selector dial to "Temperature" and record temperature to nearest 0.5°C . Adjust manual temperature compensation dial to temperature of water. Turn selector dial to "Conductivity" at the scale range appropriate to sample conductance. Record specific conductance to three significant digits. Remove and thoroughly rinse the probe with distilled water. Repeat temperature and specific conductance measurements until four sets of readings have been obtained.

8. Assessment of Precision

Calculate the mean and standard deviation of the four specific conductance measurements. If the standard deviation is greater than 5% of the mean, re-do the measurement of the sample just tested.

9. Reporting

Report the average values of the replicate measurements to the nearest 1°C for temperature and to three significant digits for specific conductance.

10. Preventative Maintenance

Preventative maintenance will be performed in accordance with manufactures instructions.

APPENDIX C
SAS REQUEST FORMS

**SPECIAL ANALYTICAL SERVICES
Regional Request**

☒ Regional Transmittal

☐ Telephone Request

1. EPA Region and Site Name: American Chemical Service, Region V
2. Regional Representative: Chuck Elly
3. Telephone Number: (312) 353-9087
4. Date of Request: _____

Please provide below a description of your request for Special Analytical Services under the Controlled Hazardous Waste Dumpsite Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: determination of total suspended solids (TSS) or "total non-filterable residue"

2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

Total of fourteen field samples (one round of seven investigative, one duplicate and one blank; one round of three investigative, one duplicate and one blank)
low concentration groundwater.

3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

Superfund RI/FS activity at Fund-lead site; to allow comparison of total metals and dissolved metals.

4. Estimated date(s) of collection: Mid-November and late December

5. Estimated date(s) and method of shipment: 11-22-85 and 12-19-85

Approximate number of days results required after lab receipt of samples: _____

30 days

Analytical protocol required (attach copy if other than a protocol currently used in this program):

Standard Method 209 Residue, 209D Total Nonfilterable Residue Dried at 103-104°C (Total Suspended Matter) in Standard Methods for the Examination of Water and Wastewater 15th Edition, 1980

Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):

Filter 200 ml of blanks

Filter a maximum of 200 ml of samples and duplicates

Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of-Custody documentation, etc.). If not completed, format of results will be left to program discretion.

reported to nearest mg/l; report QA/QC results; report all raw data

Other (use additional sheets or attach supplementary information, as needed):

Name of sampling/shipping contact: Edward A. Need, Roy F. Weston, Inc.

Phone: 312/295-6020

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions

Detection Limit

Precision Desired

(± or Conc.)

Total suspended solids

3 mg/l

±0.5 mg of residue or ±10%

if residue is greater than

5 mg

QC Requirements

Audits Required

Frequency of Audits

Limits* (% or Conc.)

Lab blank of 200 ml filtered

one

±0.5 mg of residue

Lab duplicate

one

±0.5 mg of residue

11. *Action Required if Limits are Exceeded:

re-execute the analysis in question

U.S. Environmental Protection Agency
Sample Management Office
P.O. Box 818, Alexandria, Virginia 22313
ONE: (703) 557-2490 or FTS-557-2490

SAS Number

SPECIAL ANALYTICAL SERVICES
Regional Request

☒ Regional Transmittal



Telephone Request

EPA Region and Site Name: American Chemical Service, Inc., Region V

Regional Representative: Chuck Elly

Telephone Number: (312) 353-9087

Date of Request: _____

provide below a description of your request for Special Analytical Services under Uncontrolled Hazardous Waste Dumpsite Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

General description of analytical service requested: _____

analysis of high hazard extracts for organic parameters per RAS organics SW

including tentative identification of 30 additional parameters

Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

62 high hazard extracts (52 investigative, 5 field duplicates, 5 field blanks)

Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

Superfund RI/FS activity at Enforcement-lead site

Estimated date(s) of collection: November 1985

Estimated date(s) and method of shipment: from HSL

1. Approximate number of days results required after lab receipt of samples: _____

45 days

2. Analytical protocol required (attach copy if other than a protocol currently used in this program):

per IFB WA84-A266/A267 procedures for RAS organics analysis currently in effect

3. Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):

per IFB WA84-A266/A267

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of-Custody documentation, etc.). If not completed, format of results will be left to program discretion.

per IFB WA84-A266/A267

0. Other (use additional sheets or attach supplementary information, as needed):

1. Name of sampling/shipping contact: James M. Burton, Roy F. Weston, Inc.

Phone: 312-295-6020

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions

Data Requirements

Parameter:

Detection Limit

**Precision Desired
(\pm % or Conc.)**

per IFB WA84-A266/A267

QC Requirements

Audits Required

Frequency of Audits

Limits* (% or Conc.)

per IFB WA84-A266/A267

***Action Required If Limits are Exceeded:**

Notifv: James M. Burton 312-295-6020

David A. Pavne 312-353-7712

SPECIAL ANALYTICAL SERVICES
Regional Request

☒ Regional Transmittal

☐ Telephone Request

- 1. EPA Region and Site Name: American Chemical Service, Inc., Region V
- 2. Regional Representative: Chuck Elly
- 3. Telephone Number: (312) 353-9087
- 4. Date of Request: _____

Please provide below a description of your request for Special Analytical Services under the Uncontrolled Hazardous Waste Dumpsite Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

- 1. General description of analytical service requested: _____

analysis of high hazard extracts for inorganic parameters (metals and cyanide) per
RAS inorganics SOW

- 2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

62 high hazard extracts (52 investigative, 5 field duplicates, 5 field blanks)

- 3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

Superfund RI/FS activity at Enforcement-lead site

- 4. Estimated date(s) of collection: November 1985

- 5. Estimated date(s) and method of shipment: from HSL

Approximate number of days results required after lab receipt of samples: _____

45 days

Analytical protocol required (attach copy if other than a protocol currently used in this program):

per IFB WA84-J091/J092 procedures for RAS inorganics analysis currently in effect

Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):

per IFB WA84-J091/J092

Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of-Custody documentation, etc.). If not completed, format of results will be left to program discretion.

per IFB WA84-J091/J092

Other (use additional sheets or attach supplementary information, as needed):

Name of sampling/shipping contact: James M. Burton, Roy F. Weston, Inc.

Phone: 312-295-6020

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions

I. Data Requirements

Parameter:

Detection Limit

Precision Desired
(±% or Conc.)

per IFB WA84-J091/J092

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

I. QC Requirements

Audits Required

Frequency of Audits

Limits* (% or Conc.)

per IFB WA84-J091/J092

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

II. *Action Required if Limits are Exceeded:

Notify: James M. Burton 312-295-6020

David A. Payne 312-353-7712

CAMP DRESSER & MCKEE INC.

7630 LITTLE RIVER TURNPIKE

SUITE 500

ANNANDALE, VIRGINIA 22003

703 642-5500